the OIL AND GAS JOURNAL
PUBLISHED WEEKLY MARCH 27, 1961

How Landis plans to revamp FPC

Would exempt small producers and have special panel for gas matters.

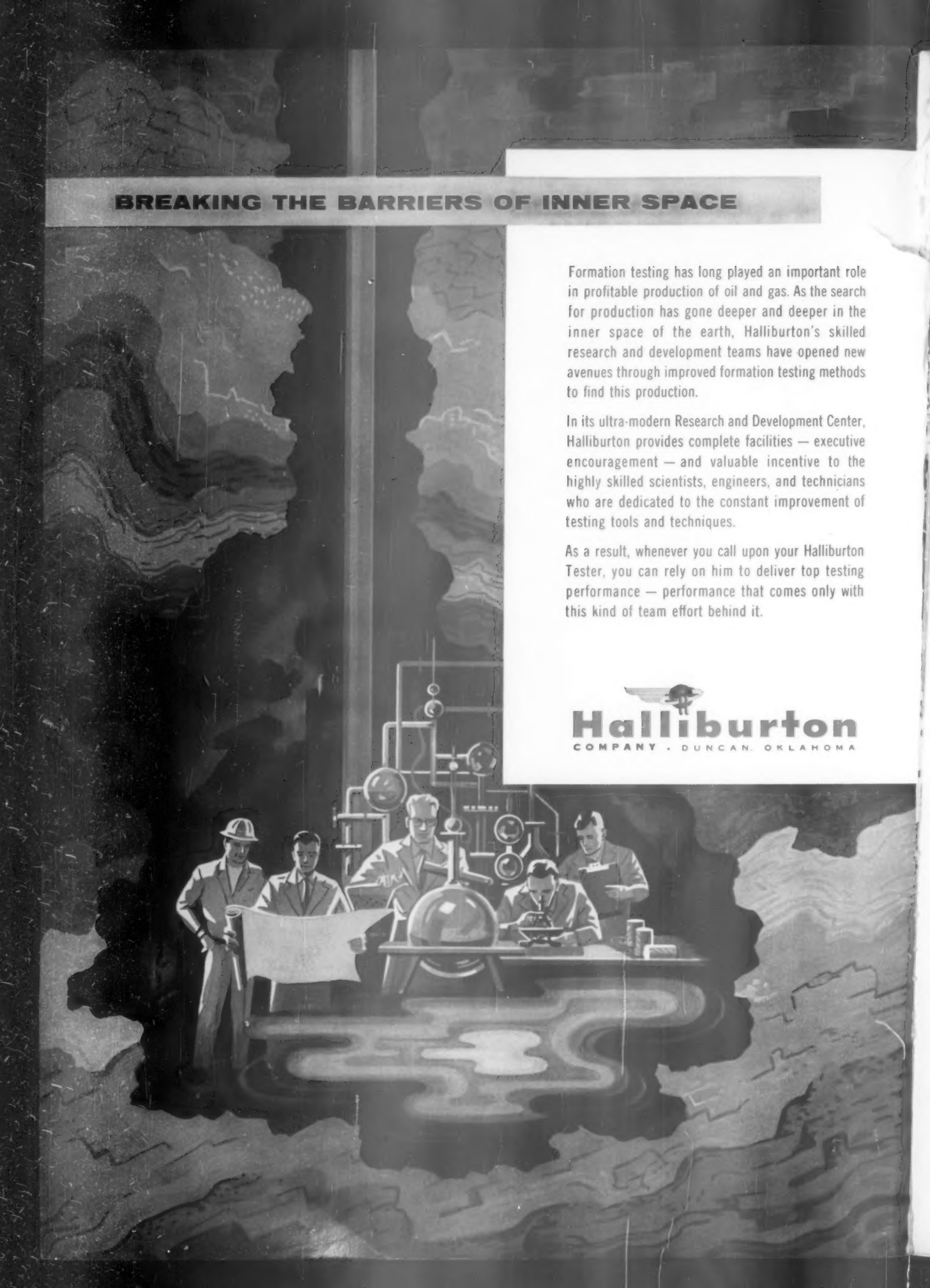
p. 55

Where Texas crude is losing markets

p. 58

How Gulf drilled to 10,000 ft. in 3.4 days

p. 82



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OIL AND GAS JOURNAL
Vol. 59, No. 13

Contents March 27, 1961

THE WEEK'S NEWS

General Interest:
Exclusive Journal Interview: How Landis Plans to Overhaul FPC 55
Domestic Crude Movement Study Shows Texas Is Losing Markets 58
U. S. Crude Reserves Down, Gas and Gas Liquids Hit New Highs 64
Rising Exports to U. S. May Force Canadian Oil Policy Showdown 74

Processing:
Topping Plant Will Be Built in Anchorage Area 60
Los Angeles Tightens Ban on Fuel-Oil Burning 61
Thermal-Diffusion Process Produces Better Lubes 61

Pipelining:
TGT Tells Why It's Buying "In-Place" Gas Reserves 62
Pipeline Briefs 74

Drilling-Production:
Louisiana Approves First Unitized Projects Under New Law 63
Unusual Mobile Offshore Rig Drilling in Gulf of Honduras 70
Fire Flood Reviving Wells Shut Down for 46 Years 71
Large Canadian Miscible Flood Scaled Down 71
Mohole Project Will Test Newest Drilling Techniques 72
Northwest Territories Gas Strike Looks Good 75

Foreign News:
Russia Plans East-West Crude Lines 76
Syria Plans to Open Bidding on Exploration Concessions 77
Deep Australian Wildcat Begins Next Month 78
Proposed Philippine Law Would Create Marketing Monopoly 78
New Israeli Company Will Build Haifa Petrochemical Plant 78
Guatemalan Marketing Struggle Shaping Up 78
Oasis' New Libyan Field Rates as Major Find 79
Japanese Let Contract for Persian Gulf Facilities 79
Foreign Rotary Drilling Falls Off Slightly 80

Exploration:
Gulf Licks Offshore Seismic-Reflection Jamming 75
New Map, New Ideas Could Lead to New Oil 151
Frankston Success Sets Off Search for Other Texas Reef Trends 152

REGULAR FEATURES

Advertisers' Index ... 177
Calendar of Events .. 47
Classified Advertising 174
Deaths 168
Discovery Wells 162
Drilling Contractors . 149
Drilling Statistics 170
Editorial 53
Equipment Men 141
Exploration Highlights 151
Foreign News 76
Foreman's Page 104
Journally Speaking .. 51
Markets 173
New Equipment 133
Personals 165
Pipeline Construction 121
Process Costimating . 101
Production 171
Refining Statistics ... 172
Statistical Summary .. 169
Technical Questions . 108
The Journal Said 51
They Say 42
Trade Literature 139
Watching Washington . 63
Who's Who in Oil ... 165

Technology-Operation section on next page ⟶

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TECHNOLOGY–OPERATION

Drilling-Production

Gulf Hits 10,000 ft. in 3.4 days in South Louisiana 82

By V. D. Stone

Rigs working for Gulf in South Louisiana recently have passed the 10,000-ft. level in less than 5 days, the fastest one being drilled in 3.4 days. These records are the outgrowth of a distinctive plan developed around reducing rig time and eliminating lost motion.

Reservoir Engineering—34 92

By E. T. Guerrero

How to estimate oil in place in a solution-gas drive by material balance below the bubble point.

Pipelining

How to Lower a Line by Hand 90

Sui Gas Transmission Co. lowered a 16-in. gas pipeline 14 ft. without mechanical aids and without interruption of service recently when the Pakistan Government decided to build a canal in the area traversed by the line.

Pipeline Construction Report 121

Refining-Processing

Process Costimating—91 101

Depreciation fails to provide replacement costs.

The Foreman's Page 104

Finding heat-transfer rate.

Questions on Technology 108

Answers to questions on LPG storage, costs of heat exchangers, and speed of new oil tankers.

Phillips Installs Automatic Asphalt Blenders 111

By Kenneth W. Brooks

The company is speeding up asphalt service by using these blenders to make uniform cutback asphalts available immediately on call. This will help minimize handling, testing, and other delays involving road-building materials.

Petrochemicals, Big and Getting Bigger 114

By T. L. Cubbage

This new division of the oil industry now accounts for 57% of the dollar value of all chemicals produced in the U. S. Upgrading is the keystone. A huge storehouse of petroleum raw materials is available, and industry does a better and more extensive upgrading job each year than it did before.

Quarterly Survey of Cracking Catalysts 120

General

How to Train People to Write Better Reports 94

By Robert F. Marschner and J. O. Howe

A staff of technically trained writers is helping engineers and scientists at American Oil Co. to write better reports. Here are the results of their experience.

Shell Expands Big California Research Center 106

Shell Development Co.'s Emeryville, Calif., research center has nearly doubled in size, as the result of a 5-year expansion program.

The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
March 27, 1961

Spate of oil-related news will pop in Washington in next few days:

President Kennedy may send a message to Congress dealing with plight of the coal industry. His move may include a proposal for a fuels policy study by the administration.

Coal has been pressing the White House hard, particularly after coal's setback on residual fuel imports and slow progress toward a fuels study by Congress.

Appointment of John Kelly as assistant secretary for minerals will go to a Senate committee right away. Quick confirmation is expected. This will enable Kelly to play an important role in shaping government oil policy.

Joseph Swidler and Howard Morgan, appointees to the FPC, also will face a Senate committee shortly. Their names were submitted to Capitol Hill by the White House last week.

Sharp opposition is likely to choice of Swidler as chairman but probably not strong enough to block his confirmation. Morgan faces little or no trouble.

Negotiations on helium plants will get started soon between four companies and Interior officials. Four whose proposals are favored are Cities Service, Panhandle Eastern, Northern Natural, and Helium Conservation Corp.

▼ ▼ ▼

Oil finders turned in poorest performance in 15 years in 1960. Result was a net decline in the nation's crude reserves.

Crude reserves declined by 106 million barrels to 31.6 billion barrels during the year. Natural-gas liquids reserves increased by 294 million barrels to 6.8 billion, thus boosting reserves of total liquid hydrocarbons to a new high (p. 64)*.

Tight proration has benefited crude producers in other states and cost Texas some of its markets (p. 58).

Study of 1960 crude shipments reveals that the Texas market at-

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*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

tracted more out-of-state crude and at same time shipments from Texas to other states declined.

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Rehearing on FPC ruling outlawing all types of indefinite pricing clauses in gas-purchase contracts has been asked by IPAA and TIPRO.

IPAA request claims commission exceeded its power in making the ruling which deprived gas producers of their rights.

Regulations are fouling up pipeline economics.

They encourage companies to add main-line capacity at $400 per M.c.f. of peak-day capacity rather than build underground storage at $100 per M.c.f.

Consultant Harry H. Fitzgerald blames this uneconomic trend on FPC rate-base policy. Rate of return is based on original cost of pipeline and compressor facilities less depreciation. Thus underground storage provides less rate base per unit.

Look for more and more in-place natural-gas sales direct to pipelines or to financial groups for resale to pipelines.

Reasons deals are attractive to pipelines: It's only way some reserves can be acquired from producers...It gives flexibility in gas dispatching...Pipeliner knows in advance what gas will cost and he is able to forestall inflation. For the producer: He gets a fat cash down payment, is freed of job of operating the field, and a big advantage; he escapes federal regulation in selling the gas (p. 62).

Indications are the method and its variations will become very commonplace with smaller gas packages.

▼ ▼ ▼

A new lube fraction separated by liquid phase thermal diffusion has resulted in a 35% decrease in oil consumption, according to Ohio Standard researchers.

The separation technique concentrates those hydrocarbon molecules which show superior lubricating and viscosity index properties. A 4-months' road test in 52 vehicles confirmed laboratory findings on the new lube oil's characteristics (p. 61).

Isobutane demand is falling off and its price is down about one cent a gallon. There's no immediate relief in sight.

The explanation: Decline in avgas sales and static position of motor octanes. Supply also is growing due to record building of natural gas processing plants equipped with fractionation facilities. When hydrocracking goes into more refineries, it will add to the supply by producing higher yields of isomers from middle distillates.

▼ ▼ ▼

Permian oil may enter Nebraska production picture. Excelsior

Oil got a good show on a test of Foraker Permian at 1 Ulferts, Dundy County. This wildcat is 6 miles east of Pierce Lake field where trio of wells has Pennsylvanian oil and northwest offset has Permian.

Middle Devonian gas pay in northeastern British Columbia may spill over into northern Alberta. Union Oil found Watt Mountain Middle Devonian gas at its Zama Lake discovery. Well flowed at rate of 10,000 M.c.f. daily below 5,100 ft. This is northernmost production in Alberta, is just east of Kotcho Lake gas field.

More gas than oil is turning up in the Beatton River-Boundary Lake Triassic oil trend in northeastern British Columbia. Four gas discoveries have been made along the trend—no new oil wells.

▼ ▼ ▼

In Canada: Freeholders Oil has paid Prairie Oil Royalties Co. $2 million for 30% interest in 500,000 acres of mineral leases plus royalties on 70 producing wells in Saskatchewan...A gloomy outlook on the future of Manitoba's oil industry has been given by a Montreal research firm in a survey made for the provincial government. The report notes no new pools are in prospect, no interest in exploration because chances of finding oil or gas are better in Saskatchewan and Alberta. Life expectancy of industry in Manitoba is now 20 years...British Columbia is using lure of newly authorized crude line linking northeastern fields with Vancouver refineries to attract bidders for its March 29 crown lease sale...Dry spring after a mild winter may permit Alberta and British Columbia operations to be resumed earlier than usual this spring. Frost already has thawed but recent rains have halted movement. Work can start when roads dry...A 3-cent tax increase on gasoline in New Brunswick is effective April 1.

▼ ▼ ▼

Industry trends: Venezuelan President Betancourt reports his regime has taken 69% of all petroleum income in 1960. He adds that oil will be the basic factor in Venezuelan economy for years and his government will continue its nationalist policy toward oil...Plastic pipe is getting a thorough test. An Ohio utility has installed it in a small town's entire distribution system...Texaco plans bigger oil tankers in coastwise trade. It has let contract for five 25,300-ton tankers to replace T-2 ships of 16,000 tons.

Freshman engineering enrollments have dropped for fourth year in a row, U. S. Office of Education reports. Total of 67,600 freshmen enrolled in engineering courses last fall compared with 67,700 in '59.

Graduate students are increasing, however. There are 31,200 enrolled for the master's degree this year, up 5.1% from 29,700 a year ago; and 6,400 seeking a doctorate, up 14.3% from 5,600 in 1959.

Market Memo

March 27, 1961

Gulf and Mid-Continent markets still haven't settled down after last week's price break in gasolines and distillates.

Gasoline broke one-half cent a gallon on all grades, all postings in both markets. No. 1 and No. 2 went off one-quarter cent.

Back of new uneasiness is lack of demand. Heating season has ended for distillates. Motoring season is still weeks away, leaving gasoline listless. Demand trouble is compounded by high stocks, too high crude runs, and unseasonal crude production.

The market position was badly exposed by sales on the Gulf to California buyers of 100-octane gasoline at one cent or more off postings. This set off a chain reaction among refiners to cut postings.

Real barometer of the trouble is stock trend in last 5 weeks. On February 10, four-product stocks were 16 million barrels under year ago. By March 17, they had jumped to 22.4 million barrels above year-ago levels, a 5-week shift upward of 38.4 million barrels. The outlook is for another 10-million barrel rise in next 2 weeks compared with last year. Unless drastic cutbacks set in, industry's profits for entire year will be ruined here in March.

The market rundown:

Gulf Coast—100-octane gasoline is being discounted a half cent off new 11.875-cent posting and 98-octane is being shaded one-fourth cent off 11.75-cent posting. No. 1 at 9.875 and No. 2 at 9.25 cents are taking one-fourth cent discounts. Even No. 6, posted at $2.30 a barrel, is being discounted 10 cents.

Mid-Continent—Gasoline posted at 12 cents is going at one-fourth off in some cases. Discounts of one-fourth to one-half are prevalent for No. 1 at 10 cents and No. 2 at 9 cents.

East Coast—Discounting is deeper but new cold snap has warded off general drop in heating oils. Gasoline market is fairly calm. Tanker rates have dropped to ATRS plus 25% or below.

Chicago, where prices are lower than in Mid-Continent, and River markets are unsettled, need testing to establish prices.

Around the marketing beat: Los Angeles gasoline marketers are being quizzed by state attorney general investigating the 5-week-old price war which has seen gasoline drop 5 to 6 cents a gallon... Skelly has dropped plans to move its marketing headquarters to Tulsa, will keep them in Kansas City, instead plans new regional offices in Kansas City, Des Moines, St. Paul...New brand name for TGT's Bay Petroleum stations, now being assimilated into Tenneco Oil operations will be Tenneco. Change will affect Bay's whole marketing area in 17 Rocky Mountain and southern states...Members of Natural Gasoline Association are voting on new name—Natural Gas Processors Association.

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PROGRESS FOR THE INDUSTRY THROUGH CONTINUING RESEARCH

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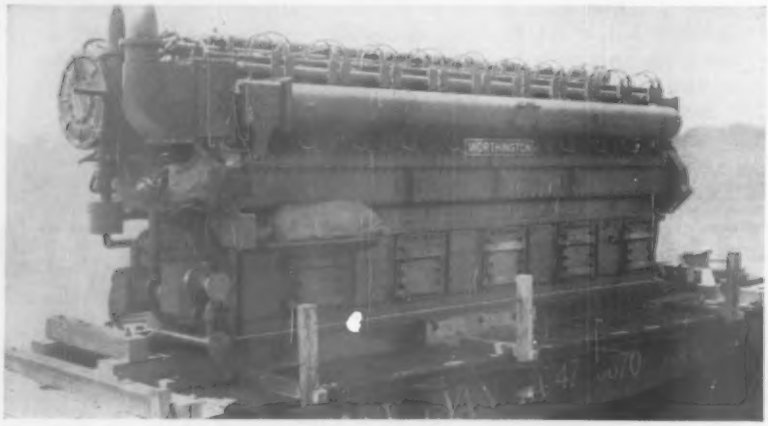
SHELL OIL COMPANY RE-ORDERS



Above, Worthington SLHC-10 gas engine compressor as it was being prepared for gas-lift service at the Ventura, California, oil field of Shell Oil Company. This unit is self-contained, with multi-purpose radiator for jacket water, lube oil and gas cooling, filters, starting air system, pulsation bottles, scrubbers, piping and controls all mounted on a structurally engineered skid. Right, one of the two "re-ordered" SLHC's that confirmed the acceptance of the first unit.

WORTHINGTON SLHC'S

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The first ten-cylinder SLHC went on outdoor service in the Fall of 1958. It is designed to operate over varying conditions with suction from 50-70 psig and discharge from 700 to 1500 psig on wet hydrocarbon gas. Manual capacity control on the first of the unit's three stages permits full loading over varying pressure ranges.

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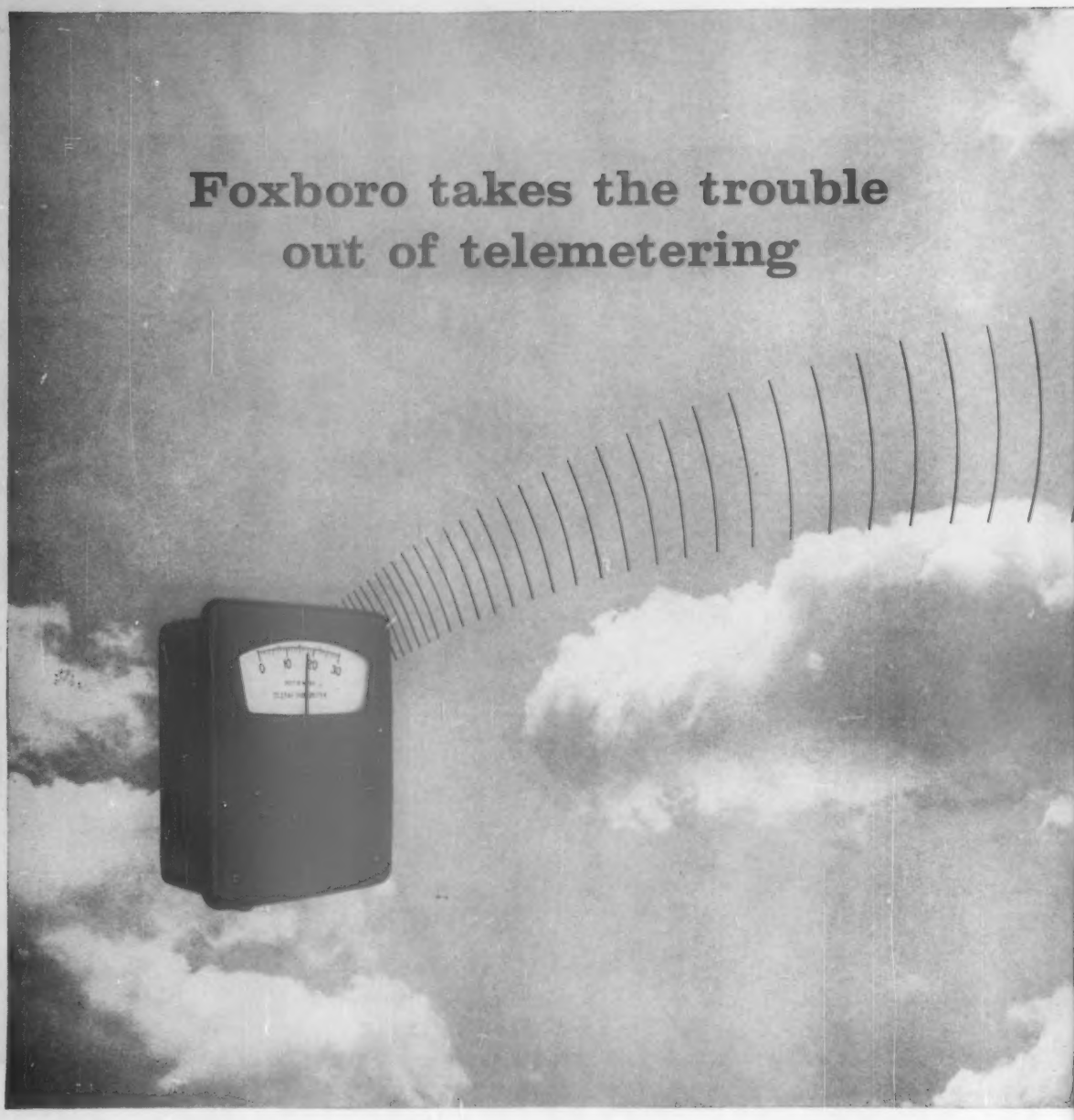

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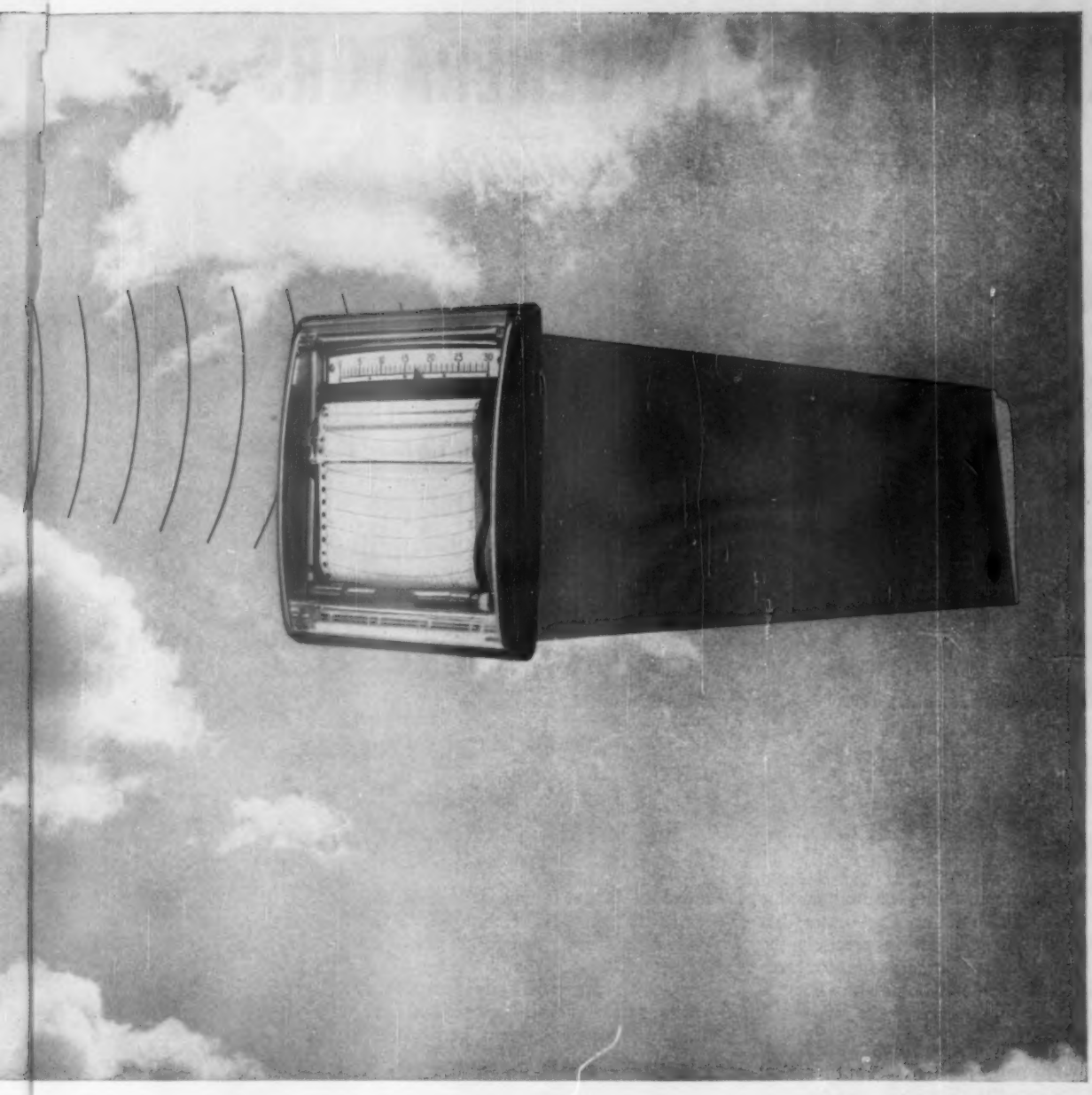

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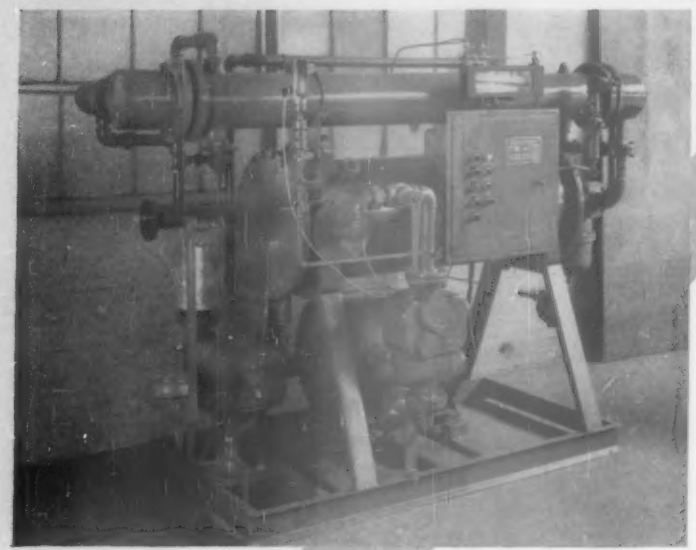

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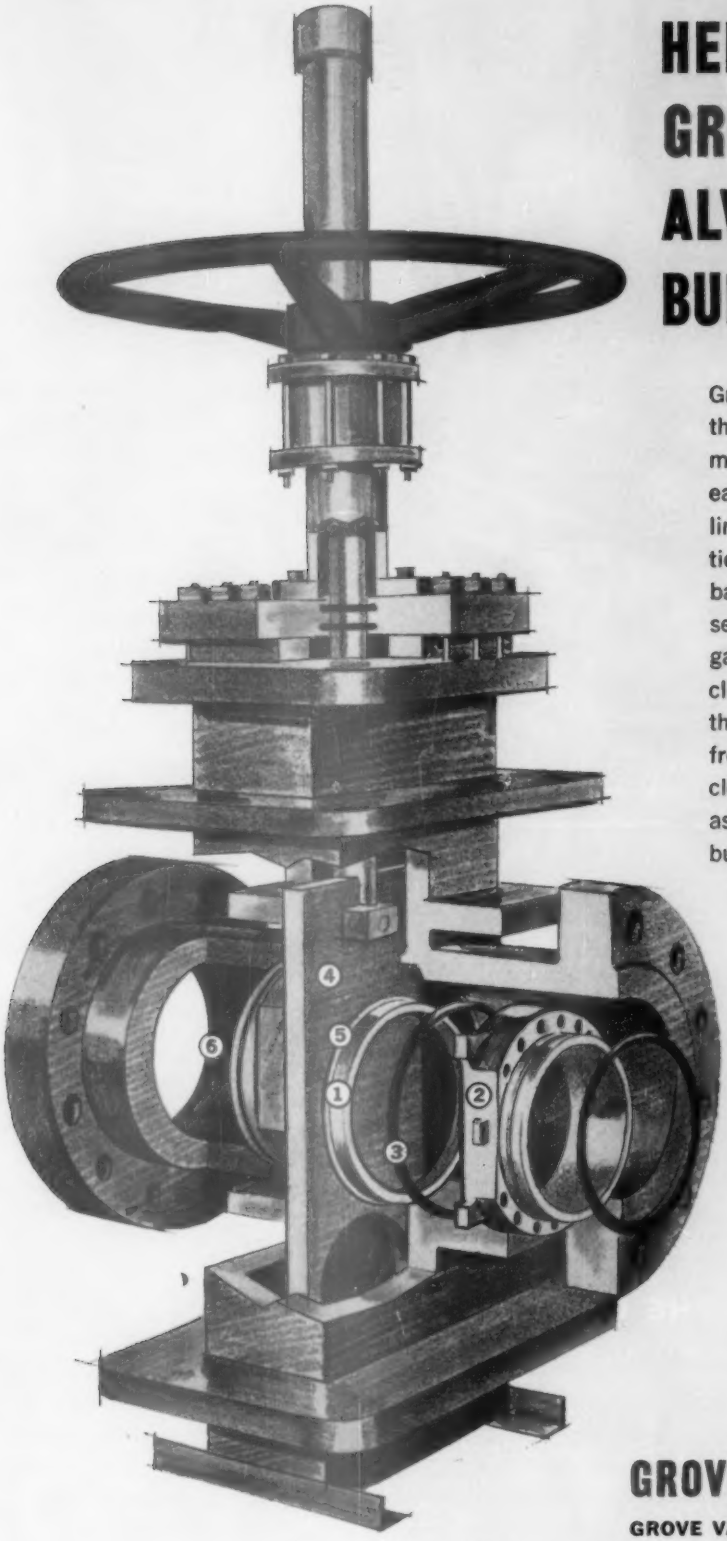

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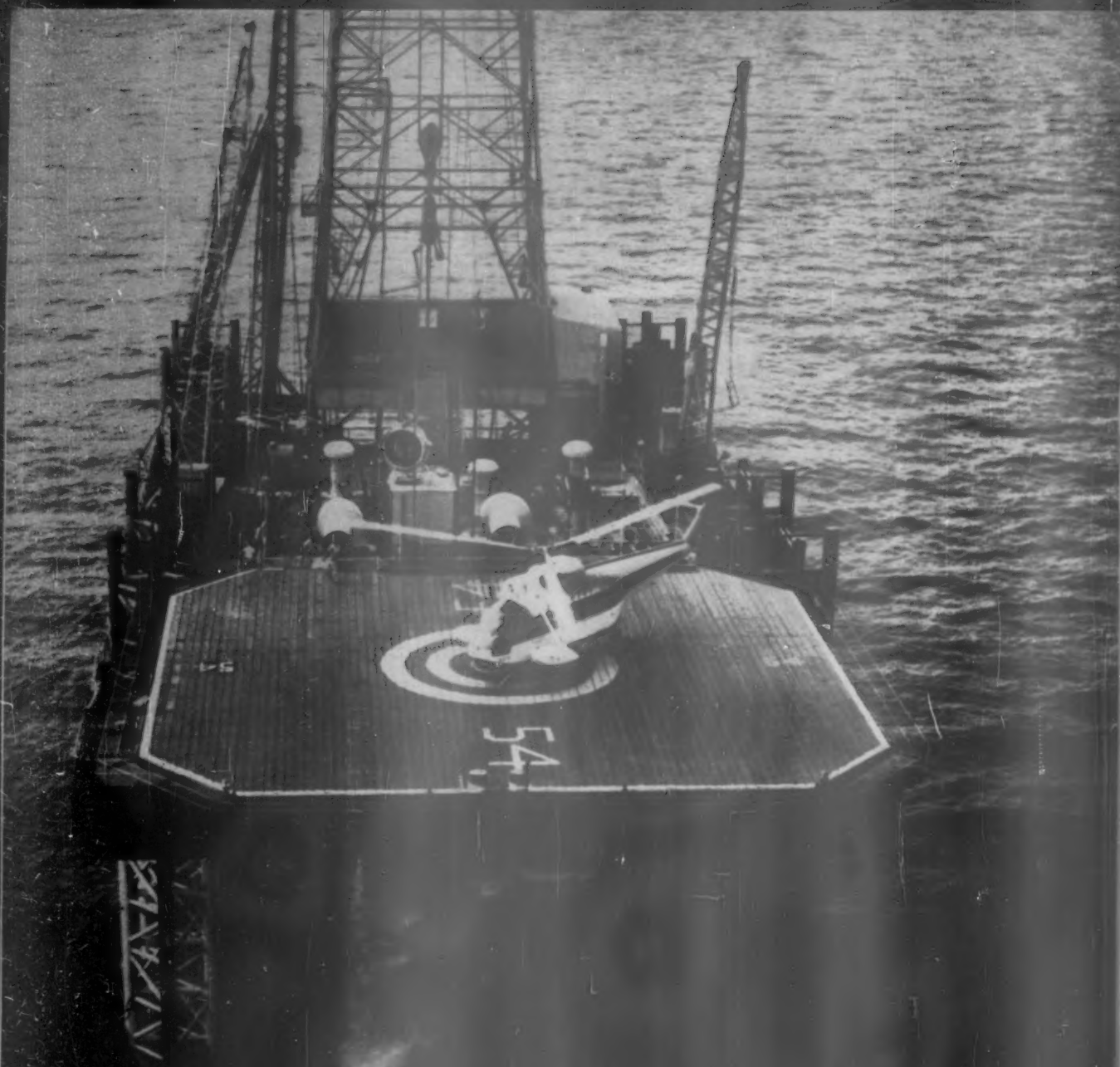


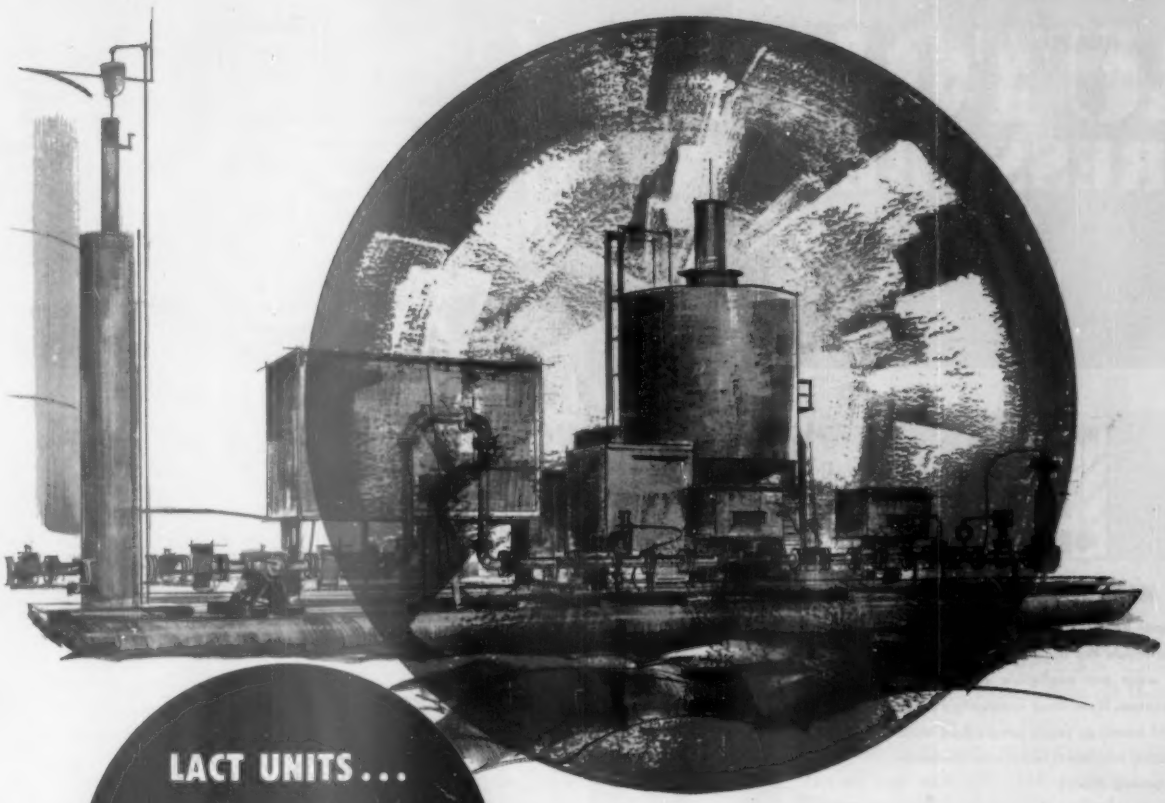
TURBOCOPTERS COME TO THE GULF

The turbine powered flying "crew boat" you see above is a Sikorsky S-62 operated by Petroleum Helicopters, Inc. in the Gulf of Mexico. First helicopter to offer the over-water safety of a boat hull, the S-62 operates equally well from land or drill rig. Its smooth, quiet turbine engine offers passenger comfort, speed and reliability never before available. It flies an 11-man crew change 75 miles out to sea—once a 12-hour boat trip—in just 40 minutes. Crews arrive at the rig fresh, relaxed, ready for work. The S-62 cruises at 100 miles per hour... flies close to three hours without refueling. Learn more about the remarkable economies and operating features of the boat-hulled Sikorsky S-62. A note on your letterhead will bring you complete information.

UNITED AIRCRAFT CORPORATION

SIKORSKY AIRCRAFT DIVISION

Stratford, Connecticut



LACT UNITS... Bradford Supply Handles the Complete Package

Bradford Supply Company's experienced engineers will gladly discuss the advantages of complete automation in oilfield production problems and savings to producers, pipeline companies and refiners.

Whether it concerns LACT, water-flooding, or drilling and production equipment, Bradford Supply helps find better solutions.

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53 Years of Service to the Oil and Gas Industry

NOTHING excels this unit for

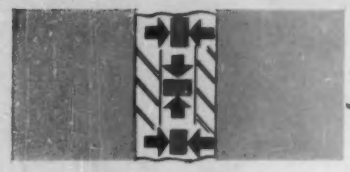
AUTOMATIC PRESSURE CONTROL WHILE DRILLING!

THE SHAFFER ROTATING BLOW-OUT PREVENTER AND STRIPPER

has no equal in modern pressure control protection because no other equipment is so versatile... so simple ...*so dependable!*

It *automatically* seals off around the drill string when the tools are in the well. You can run drill collars, tool joints, subs and drill pipe through it—going in or coming out—and *the Stripper Rubber maintains its pressure-tight seal throughout all drilling and pipe-changing operations.* Pressure emergencies simply cannot happen too fast for this unit. It is always sealed off until the drill string is removed from the well.

Check over the important features outlined below. You'll find the Shaffer Rotating Blowout Preventer and Stripper ideal for every important drilling requirement!

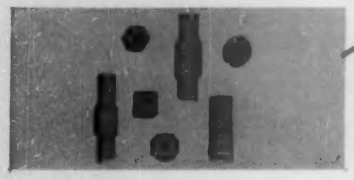


WEAR-FREE!

The Stripper Rubber rotates with the kelly—not one inside the other. Therefore, flexing and wear are negligible as the drill string rotates. Note that separate thrust and radial bearings (each pre-packed with heat-resisting lubricant) resist any combination of bearing loads!

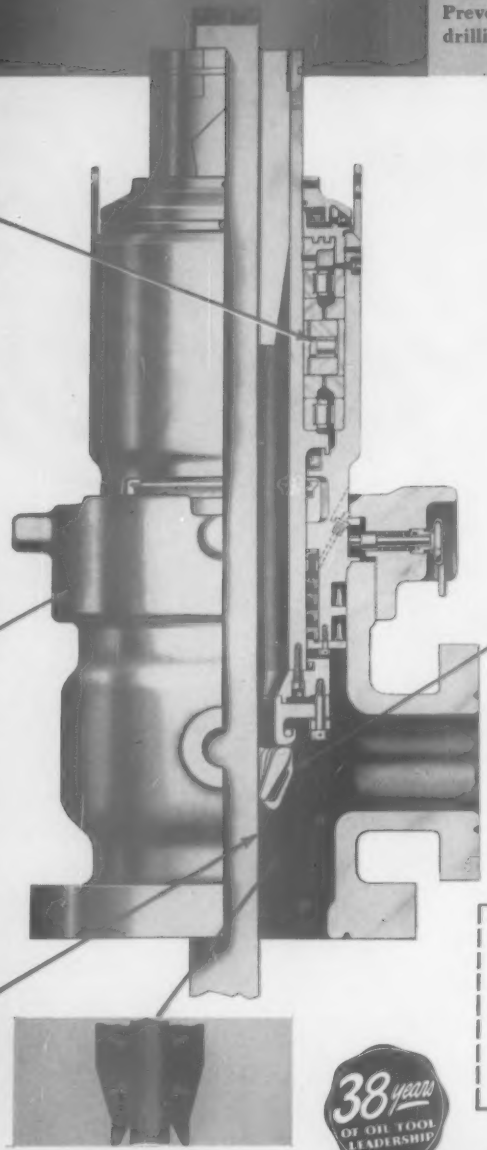
SIMPLE!

To pass bits, reamers and other abnormally-large diameter tools through the unit, simply lower the tools through the body until the rotating assembly seats in place. Then rotate the bonnet 1/6 turn. This locks the entire internal mechanism in place, to provide a continuous seal against well pressures.



VERSATILE!

All the varying diameters in the drilling string—drill collars, tool joints, subs and drill pipe (whether upset, flush or coupled)—readily pass through the Stripper Rubber without loss of pressure—and without any manual adjustments. Even the kelly—whether square, hexagon or octagon—is sealed off *automatically!*



CONTINUOUS!

The Stripper Rubber expands and contracts automatically to fit all normal elements in the drill string (excepting only bits, reamers and similar large diameter tools). No hydraulic, pneumatic or mechanical pressure need be applied. No accessory equipment is required!

COMPACT!

Unit is amazingly compact in all dimensions—can be installed in unusually "tight" locations. Even flow connections are built-in—no space-wasting spools are required!

TROUBLE-FREE!

A barrier of flexible steel latches protects the Stripper Rubber against damage while varying diameters pass through the unit. This expandable steel barrier also protects the rubber from extrusion under high well pressures!

TWO TYPES—Use the Type 50 for drilling through 10¾" casing and larger... Use the Type 51 for slim hole drilling, production and rework jobs. Both have the same basic features!

For further details see your nearest Shaffer representative, or write direct!

38 years OF OIL TOOL LEADERSHIP

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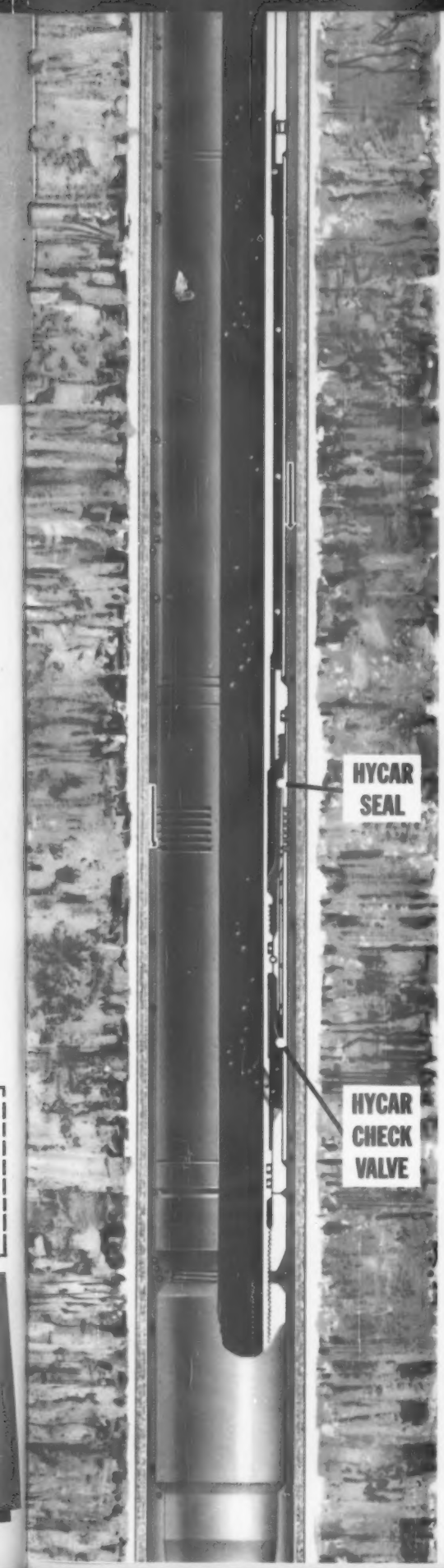
HOUMA, LOUISIANA, Shaffer Tool Works, Post Office Box 827
EXPORT SALES OFFICE: Shaffer Tool Works, 500 Fifth Avenue, New York, N. Y., U.S.A.



This Type C Otis Gas Lift Valve uses Hycar resilient elements developed by Murray Rubber Company, Houston, for the valve manufacturer, Otis Engineering Company, Dallas. Both Murray and Otis participated in thorough testing of Hycar to test its resistance to gas penetration before selection of material for these parts. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.

Another new development using

B.F.Goodrich Chemical

raw materials

HYCAR SOLVES GAS PENETRATION PROBLEM

The manufacturer of this gas lift valve wanted a rubber that is dense and capable of withstanding gas penetration. His tests showed that Hycar nitrile rubber provides the answer. Here's the report:

"Our penetration test consists of supporting a rubber slab with pressure of 800 p.s.i.g. natural gas on one side, the other sealed to atmosphere. The fixture was then submerged in a controlled-temperature oil bath at 250°F for 48 hours. There was no penetration. So we continued the test for another 48 hours. This is the only resilient material we have found that has shown no signs of penetration in this test. As a result of these tests conducted in 1959, the manufacturer has standardized on Hycar nitrile rubber in 1960."

In addition, this manufacturer wants properties hard to find in resilient materials—but which are provided by Hycar. They include good shear resistance, elasticity, ability to withstand hot water without shrinkage or hardening, and ability to withstand crude oils with a minimum of swelling and deterioration.

It's no wonder that you find Hycar again and again the choice for handling oil field rubber problems. For more information write Dept. FH-9, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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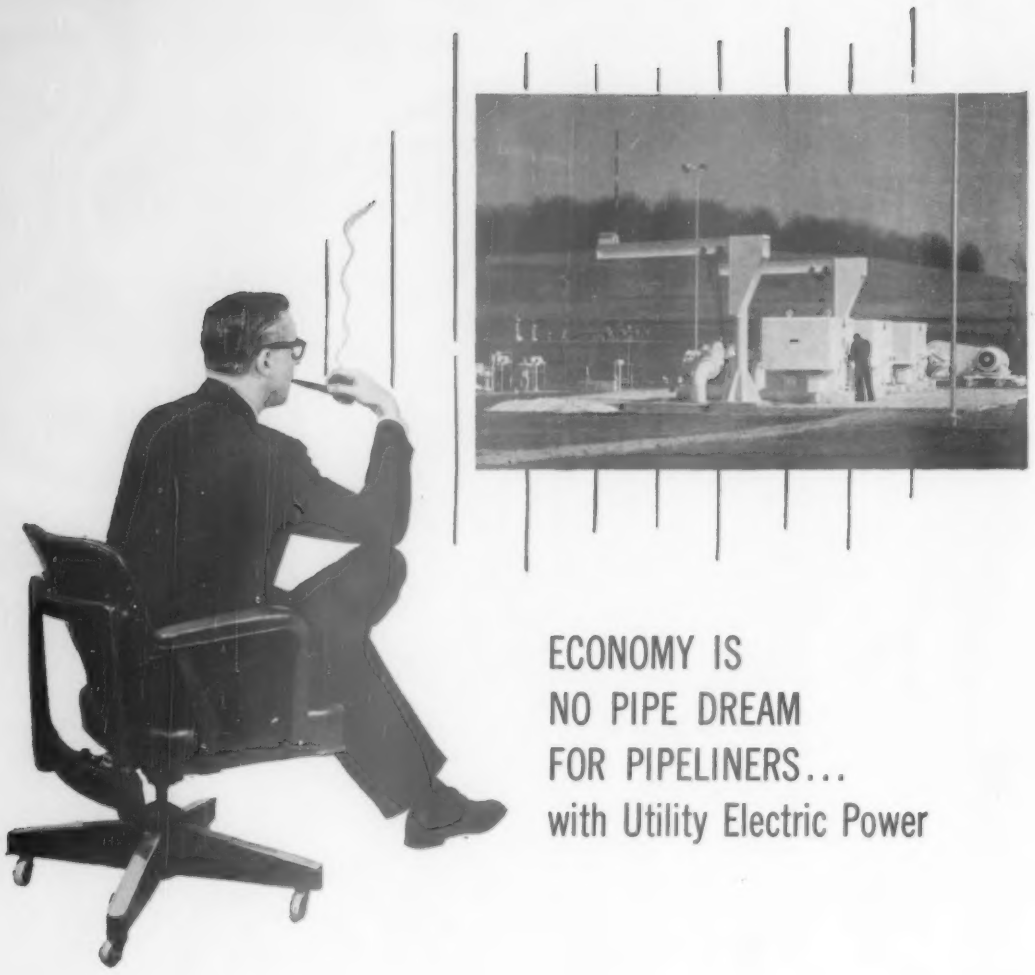
Memo to Management:



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A list of P.E.P.A. members will be furnished on request

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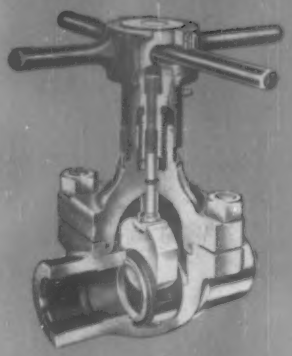

Figure 2126 Resilient Seat Gate Valve. 2", 3", 4", 2000 lb W.P. EValcoat protective Plastic Coating.

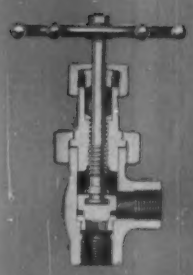

Figure 2699 Forged Steel Angle Valve. ½", ¾", 1", 2000 lb WOG. Not Plastic Coated.

Figure 152J Forged Steel Gage Valve. Size ½", 4000 lb WOG. Not Plastic Coated.

Figure 2668 Throttle Disk Forged Steel Globe Valve. Size 1", 2000 lb WOG. EValcoat Plastic Coating.

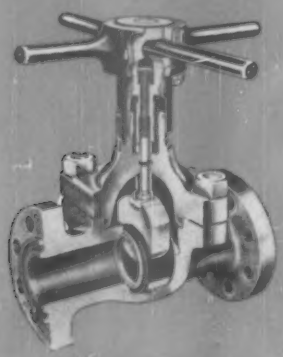

Figure 3116 Resilient Seat Gate Valve. 2", 3", 4", 2160 lb W.P. EValcoat protective Plastic Coating.

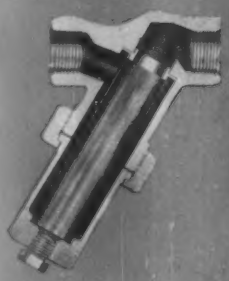

Figure 126 Forged Steel Strainer. Size 1", 2000 lb WOG. EValcoat protective Plastic Coating.

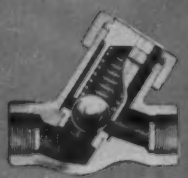

Figure 2676 Forged Steel Check Valve. Size 1", 2000 lb WOG. EValcoat protective Plastic Coating.

Figure 448 Forged Steel Globe Valve. 1½", 2", 2000 lb WOG. Not Plastic Coated.

NEW, BROADENED LINE OF ROCKWELL-BUILT EDWARD STEEL WATERFLOOD VALVES

Available with and without exclusive EValcoat* protective plastic coating

EDWARD STEEL VALVES
another fine product by
ROCKWELL

Now you can get service-proved Edward steel valves for every waterflood service . . . from pump house to well head.

You can get any size you need from ¼" to 4" and any pressure class to 3000 lb W.P. All types, too: globe valves, resilient-seat gate valves, check valves, gage valves and strainers.

For maximum corrosion resistance most Edward waterflood valves are available with exclusive "EValcoat" plastic coating, a premium feature at a modest price. Or you can get similar non-coated valves for those floods where plastic protection is not required.

For more information, see your favorite oilfield supply store, or use the handy coupon.

*EValcoat is a Trade Mark of Edward Valves, Inc. 6016

Edward Valves, Inc.
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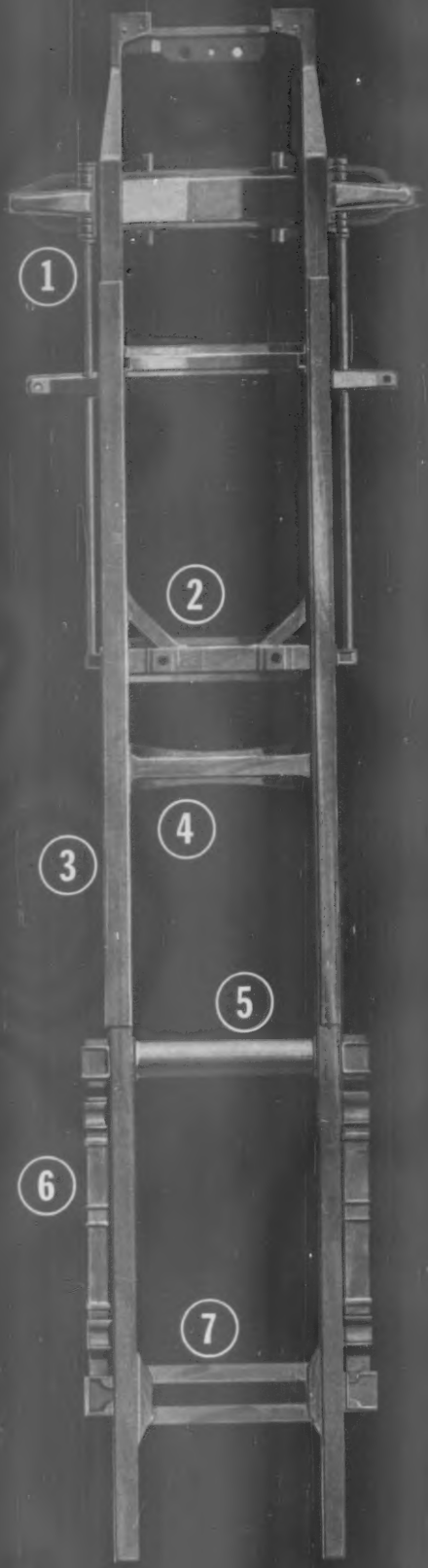
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HERE'S BONUS BACKBONE BRAWN—CHEVY TRUCKS SPECIALLY EQUIPPED FOR EXTRA-SEVERE DUTY!

They're built to blaze trails lesser trucks can't travel—to bull their way through brutal back country with king-sized loads—to stand up to terrain that can turn ordinary trucks into scrap iron before their time. Chevrolet's new heavy-duty off-highway chassis equipment option is good news for off-road operators everywhere. Now you can get the profit-protecting advantages of years-ahead Independent Front Suspension ride combined with the extra chassis beef your kind of work demands. The tougher your task, the more you'll appreciate the strength and durability built into this one!

■ **EXTRA BEEF FOR BRUTAL DUTY:** That beaver emblem on the sides of Chevrolet's new extra-duty-equipped medium- and heavy-duty trucks will be showing up more and more where the jobs are toughest—where getting the work done demands performance beyond the normal call of duty. These Chevies look the same on the outside, but there's a big difference down deep. More than just an add-on or build-up package, Chevrolet's new off-road equipment option combines maximum-duty suspension components with a special-built frame that's engineered for all-out ruggedness in every detail. A frame with K-braced ladder-type construction that delivers extra torsional resilience to soak up brutal beatings.

Here's what you get: ❶ Heavy-duty 4,000-lb. torsion bars up front, anchored right at the frame K-brace crossmember for sturdy support. (Anchors are truss-rod-connected under the frame for an extra margin of strength.) ❷ Massive K-brace crossmember between the torsion bar anchors, specially designed for maximum structural rigidity and fabricated of high-tensile-strength steel. ❸ Extra-heavy side rails, of full quarter-inch stock, with full-length L-plate reinforcements. ❹ Heavy-gauge alligator-jaw crossmembers in frame midsection that combine high strength with give-and-take resilience. ❺ A massive tubular crossmember, anchored in extra-heavy cast steel brackets at the rear spring front hangers. ❻ Maximum-duty 11,500-lb. rear springs of standard variable-rate design, plus the extra margin of 2,000-lb. auxiliary springs. And ❼ a massive double channel crossmember at the spring rear hangers heavily gusseted fore and aft—the finishing touch of rock-ribbed ruggedness between roughest roads and heaviest loads.

If yours is a truck-killing job, this new option is tailor-made for you. You can get it on any of four medium- and heavy-duty models to match your needs best, and you'll be surprised at how little it costs. See your Chevrolet dealer right away for full details. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Availability: Heavy-Duty Off-Road Chassis Equipment

Model	Wheelbase	Cab-to-Axle	Max. GVW	Front Suspension Capacity	Rear Axle Capacity
C6303	157″	84″	19,500 lbs.	5,000 lbs.	15,000 lbs.
C6503	175″	102″	19,500 lbs.	5,000 lbs.	15,000 lbs.
C7303	157″	84″	23,000 lbs.	7,000 lbs.	16,000 lbs.
C7503	175″	102″	23,000 lbs.	7,000 lbs.	16,000 lbs.

1961 CHEVROLET STURDI-BILT TRUCKS

CHEVROLET

SILICONE NEWS from Dow Corning

Now...Time for the Boys

Electrical Problems No Longer Short Circuit Our Family Fun

Sure, a father should be a pal to his sons . . . and, mine are at the age when they need and appreciate my companionship most. But when you're lucky enough to be employed at an assembly plant that's doubled capacity twice in the past eight years, you've got more than a full time job . . . and family activities frequently have to take a back seat.

During these eight years I've come up through maintenance to Assistant Plant Manager. It started when I suggested we replace certain troublesome motors with silicone insulated units. Then, when we doubled our plant the first time, I suggested we could double our electrical load capacity in the same floor space by using silicone insulated transformers. Just before our last expansion, my boss was made Plant Manager and I moved up to his assistant. He's taught me a lot . . . and I think I've helped him. We're a good team. And, for the first time since I started working, I'm finding time to really enjoy my boys. By the way, the car we're restoring is a Model A. No, not a Ford . . . a Dusenberg.

I think my progress is the result of plenty of hard work and a good eye for new and better ways of doing things. One of the most important things I've ever read was an advertisement on Dow Corning silicone insulation for electrical transformers and motors—just as you're doing now. I wrote for more information. Why don't you?

For brochure, "Specify Silicone Insulation and Save", Write Dept. 6215a.

first in silicones

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THE BREAK-THROUGH TO DECREASED DRILLING COSTS

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The development and perfection of this altogether new approach to drilling mud began more than six years ago. During those years, hundreds of compounds were made and evaluated before Uni-Cal was synthesized in Milwhite's Research Laboratories.

Uni-Cal, Super-Col, Lubri-Film and many other special products are all engineered for Decreased Drilling Costs.

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Bethlehem Wire Rope On Its Third Well. This is Midland Exploration Company's Rig No. 14, drilling HDU9-4, a 12,000-ft well near Odessa, for Texas Gulf Production Co. At the time of the photograph, the well was at 9,520 ft. Though it was drilling its third well, the Bethlehem Wire Rope—1¼ in. 6 x 19 Form-Set, improved plow steel, right lay, with IWRC—showed no signs of tiring.

Steel

for Strength
. . . Economy
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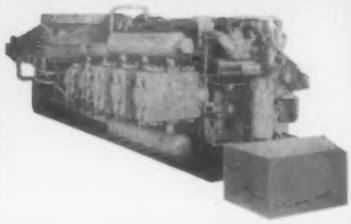
Export Sales: Bethlehem Steel Export Corporation

There's a distributor of Bethlehem Rope near you, supplied by our nationwide network of wire rope mill depots.

BETHLEHEM STEEL

BETHLEHEM STEEL
BETHLEHEM WIRE ROPE



Design engineered for gas booster service in the Louisiana Gulf Coast area, this packaged GMXF-10 compressor moves 4.43 MMSCFD. It is rated at 825 bhp. Equipped with Entronic Controls for remote field operation, this unit is a typical example of the efficiency gained by specifying C-B/Southern Packaged Compressor Plants.

CB/S

PACKAGED COMPRESSORS

Designed Engineering For . . .

CB/S Packaged Compressors Starts With the Customer's Problem

Sound gas compression engineering starts with understanding the basic problem. C-B/Southern sales engineers are registered petroleum engineers with actual producing experience. They assess the customer's problem, whether it is gas gathering, gas lift or gas injection, to make positive, workable suggestions. From quotation to field installation, engineering knowledge is based on practical experience. For example, last year, C-B/S built more horsepower than any other two compressor packagers combined. And because the company offers the widest range of horsepower size, C-B/S engineers have the right component to meet every specification the customer wants.

As an added benefit, C-B/Southern Packaged Compressor Plants are never orphans. Backed up by engineers in 22 Cooper-Bessemer sales and service offices, C-B/Southern service operates on a 24-hour schedule, everywhere.

C-B/S Packaged Compressor Plants are available in horsepower ratings from 100 to 1100; unitized compressors, both reciprocating and centrifugal, to 10,500 horsepower.

CB/S

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Manufacturers of packaged compressor plants for gas gathering, gas lift, gas injection applications

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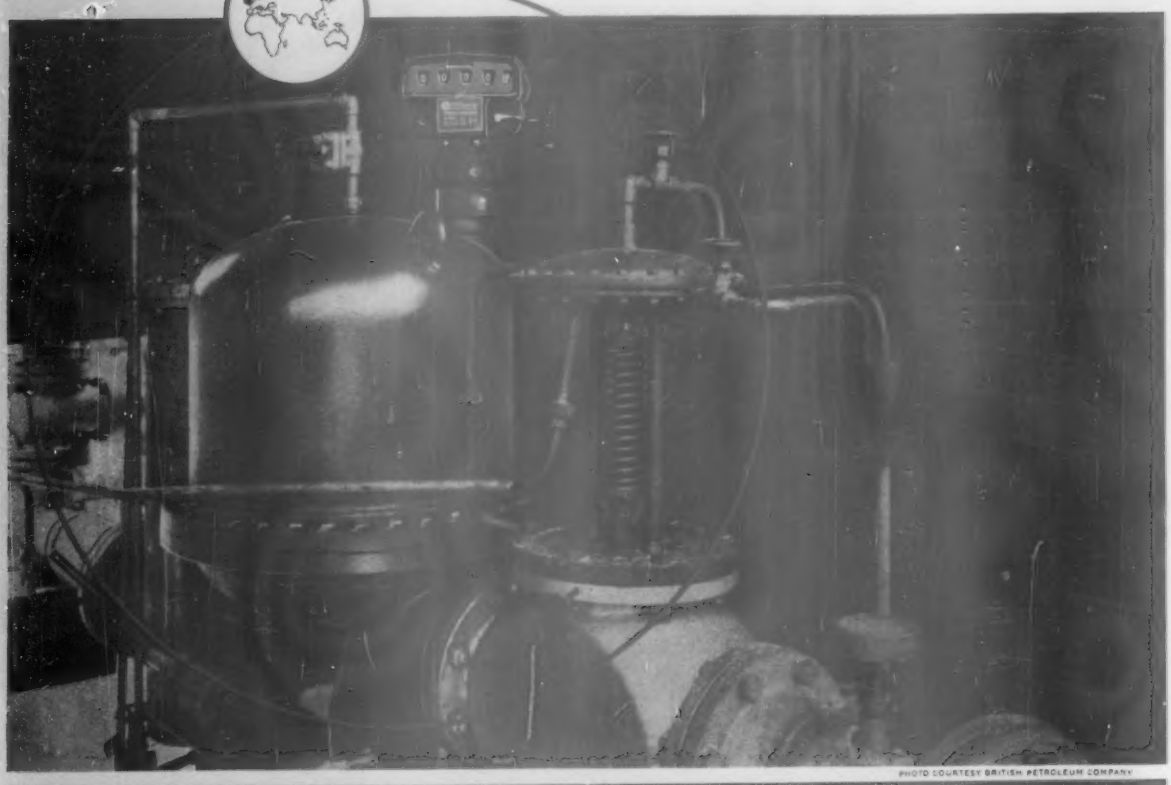
Everywhere—Brodie is linked with Progress. At British Petroleum Company's Grangemouth Refinery Marine Terminal in England, ten big Brodie B203E BiRotors handle tanker loading and transfer at full capacity, 2100 GPM.



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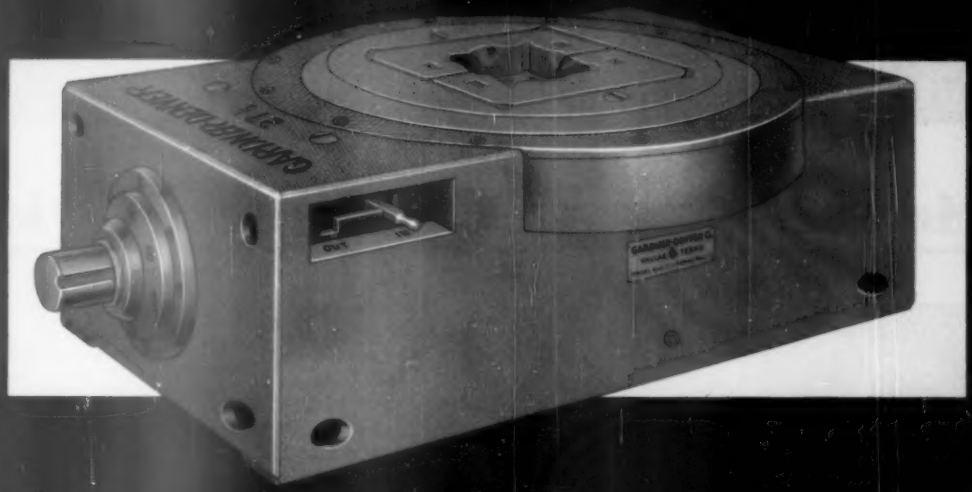
with faith in the oil industry's future . . .
GARDNER-DENVER MAKES THE NEWS

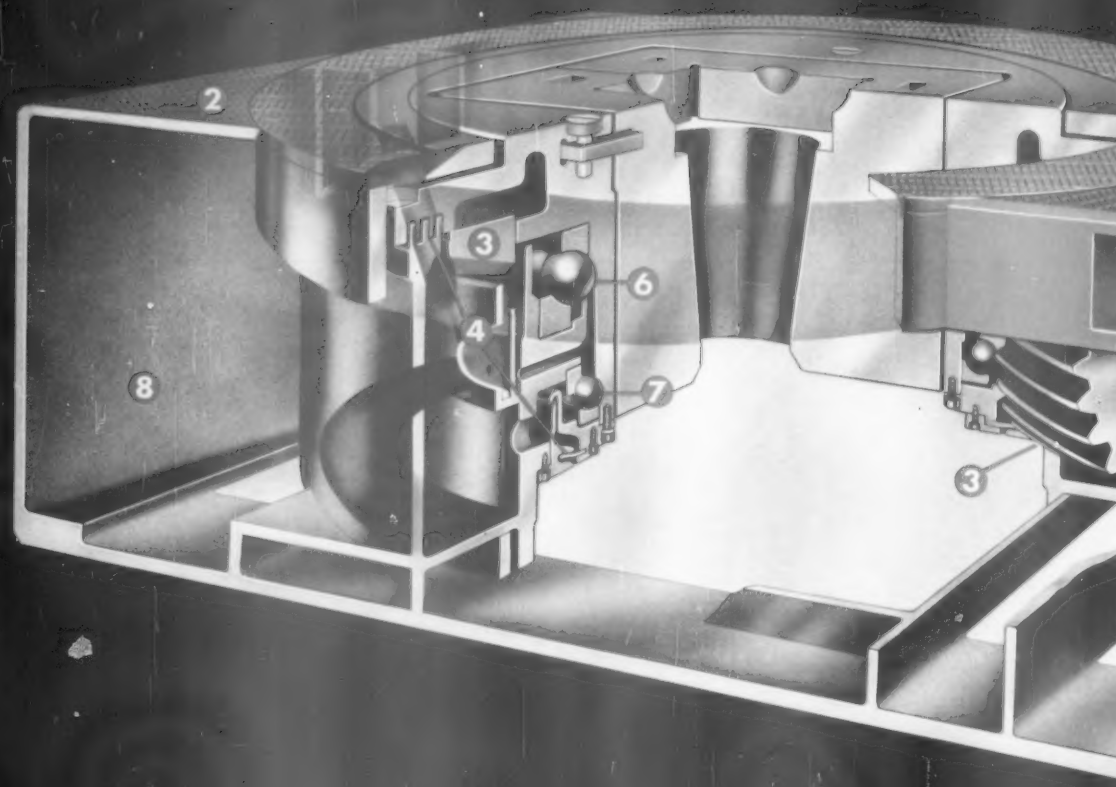
new . . . rotary tables

for the drilling industry

ON THE OUTSIDE all rotary tables look much alike. But take a look inside Gardner-Denver's new rotary tables. Check them point by point against any others existing. Compare every creative-engineered component. See how Gardner-Denver builds newness into rotary tables to provide smooth performance, longer maintenance-free operation. Fold out the page and you'll see that . . .



It's what's inside that counts



Inside view demonstrates

1. Dual locks for make-up or break-out—table ratchets to left or right, or locks in fixed position. Safety-positioned below floor plate.

2. Safe, nonskid floor plate—1" steel plate is free of projecting bolts or filler plugs. Provides safety to drilling crew.

3. Turbo-lubricated ring gear and pinion—flood of oil lubricates ring gear and spiral bevel gear. Gears are matched and lapped for smooth operation.

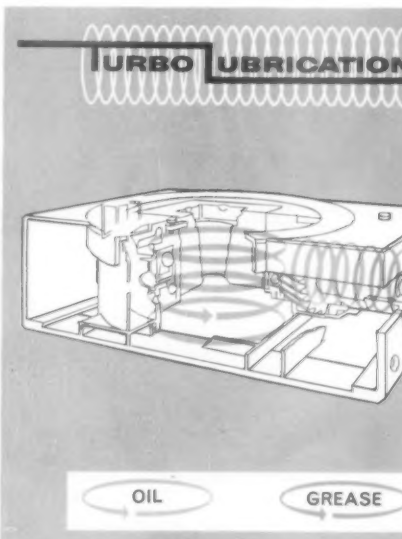
4. Efficient oil seals protect internal working parts—triple-labyrinth upper seal and positive lower seal protect gears and bearings from foreign material. Close-fitting oil seal protects pinion bearings.

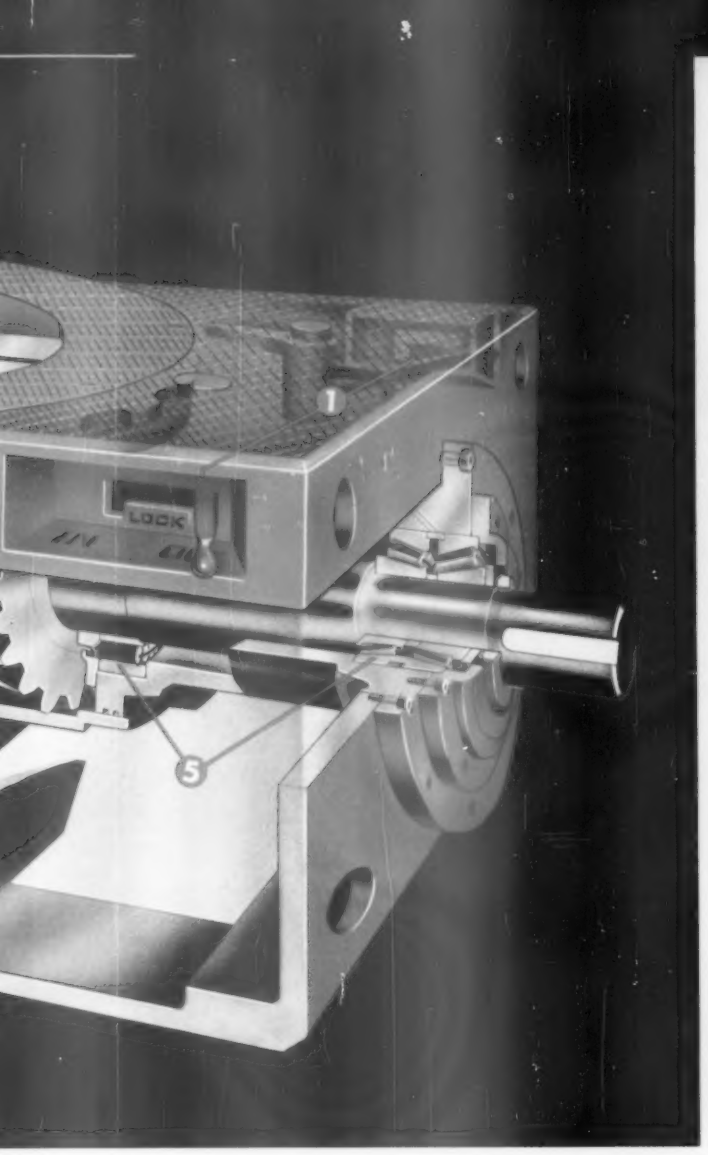
5. Individually lubricated pinion bearings—direct grease application to each bearing assures positive lubrication under heavy shock loads. Grease fittings are grouped near the oil filler plug. Straight and tapered heavy-duty roller bearings have been combined on the pinion shaft assembly to handle heavy thrust and radial loads.

6. High-load-capacity main bearing—highest quality, engineered to Gardner-Denver specifications. Balls run in hardened steel races. All Turbo-lubricated and cooled by a constant circulation of oil.

7. Ball-type hold-down bearing—holds table and gears in accurate alignment under heaviest loads. Elimination of slack protects gears from chatter and wear. Turbo-lubrication carries away heat and extends bearing life.

8. Streamlined, fabricated steel housing—ruggedly built of steel plate. Stiffener plates and ribs add rigidity at high-stress points for maximum strength.





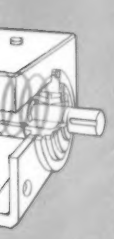
Complete line of matched rig equipment for economically drilling 4,000 to 30,000 feet

DRAWWORKS	ROTARY TABLES	TRAVELING BLOCKS	SWIVELS
GD 500 HP	17½" 234 Tons*	125 Tons*	125 Tons*
GD 700 HP		200 Tons	200 Tons
GD 1100 HP	22½" 378 Tons	300 Tons	300 Tons
GD 1500 HP		400 Tons	400 Tons
GD 2100 HP	27½" 432 Tons	550 Tons	550 Tons

**Dead load capacity*

s Gardner-Denver superiority

ON



ONLY GARDNER-DENVER rotary tables have Turbo-lubrication to increase the life of working parts. Turbo-lubrication cools and lubricates every moving part with a fast-moving stream of oil. Oil picked up from the large reservoir by the pinion gear is force-circulated by the ring gear—then centrifugal action speeds the oil flow and distributes it evenly over the gears and main bearing. As the oil returns to the reservoir, it cascades over the hold-down bearing. This large volume of cool oil adds thousands of hours of maintenance-free service to Gardner-Denver rotary tables.

SE

GARDNER-DENVER Since 1859

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Ill.—Offices in principal U.S., Canadian and Mexican cities.
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario.

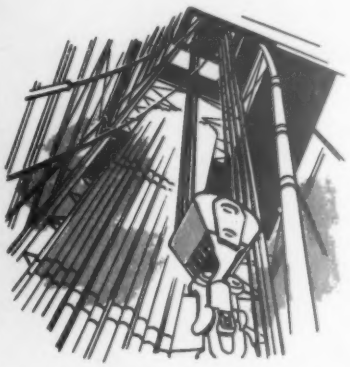
International: Gardner-Denver International Division, 233 Broadway, New York 7, N.Y.
Offices: Buenos Aires, Argentina; Artarmon, N.S.W. Australia; Brussels, Belgium; Rio de Janeiro, Brazil; Santiago, Chile; Barranquilla, Colombia; Lima, Peru; Ndola, N. Rhodesia; Salisbury, S. Rhodesia; Johannesburg, Transvaal

LITHO IN U. S. A.

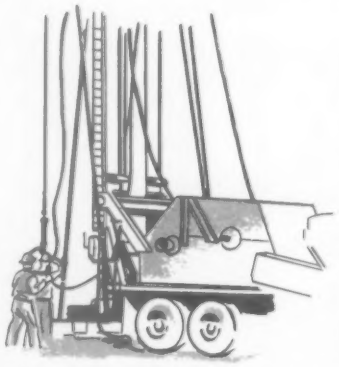
Is "any old" wire rope out of "any old" stock good enough?

Not when you can get what you need from the best combination of wearing qualities in the right Macwhyte!

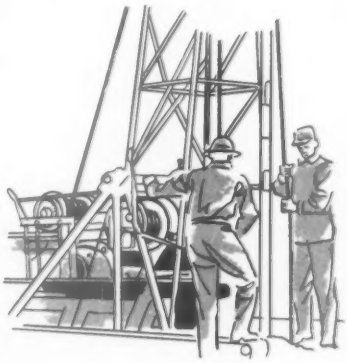
NEED EXTRA STRENGTH?



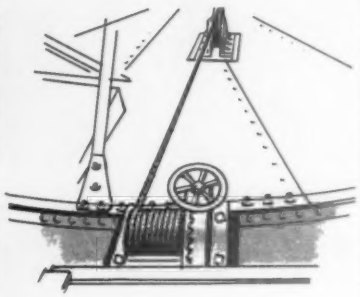
NEED RESISTANCE TO ABRASION?



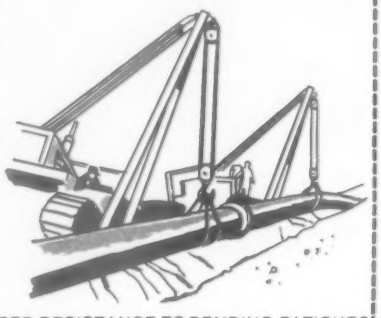
NEED EXTRA REACH AND IMPACT?



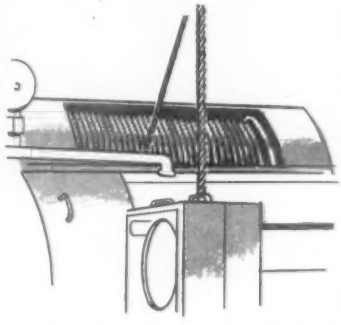
WHICH COMBINATION OF THESE WEARING QUALITIES DO YOU NEED?



NEED RESISTANCE TO CORROSION?



NEED RESISTANCE TO BENDING FATIGUE?



NEED RESISTANCE TO CRUSHING?

INDUSTRIAL • AIRCRAFT • MINING • LOGGING • ELEVATOR • MARINE • CONSTRUCTION • DRILLING
MACWHYTE
THE RIGHT MACWHYTE
WIRE ROPE
MADE IN U.S.A.

Stocked for immediate delivery

You can place your trust in Macwhyte Distributors to give you the right wire rope for your oil field equipment.

Macwhyte manufactures a thousand and one wire ropes to give you the right combination of wearing qualities your equipment demands.

For lowest-cost service, ask for the right Macwhyte wire rope specially suited to your equipment. Circular 5956R, free on request, explains why you can save with the right wire rope on your oil field equipment.

ASK ABOUT MACWHYTE'S NEW 7-FLEX® WIRE ROPE

MACWHYTE WIRE ROPE COMPANY 2900 FOURTEENTH AVENUE KENOSHA, WISCONSIN

Wire Rope Manufacturing Specialists since 1896

239-0

LOOKING BACK WITH PRIDE
LOOKING AHEAD WITH HOPE

The Supply Industry can indeed look back with **pride** at the decades of responsible service it has rendered the Petroleum Industry. Accepted as part of the team, it has shared the pains of progress through depressions, wars, shortages and surpluses.

The Supply Industry cannot now foresee what lies around the next turn in the road. Current pressures might destroy its ability to exist — but nothing can destroy the sound economic reasons for its continued existence as a healthy arm of the Petroleum Industry.

Vision has been the great vehicle of progress for the Petroleum Industry. In this vision lies the **hope** of the Supply Industry.

LARKIN PACKER COMPANY

DIVISION KOEHRING COMPANY

WAXAHACHIE, TEXAS

LARKIN

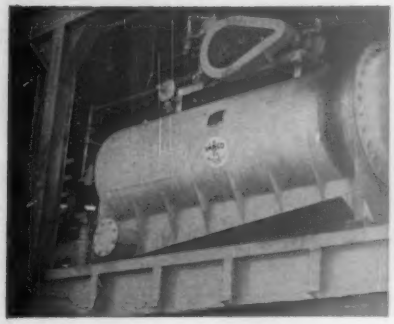
...Through Your Supply Store

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

61-101

Three good ways to cut drilling costs

The three units shown here are important items behind the recent revolution in drilling fluids that has done so much to speed drilling and cut costs. Each is designed for a different problem but all are efficient and economical. Equally important, all are handled by SWACO -- the leader in mud-treating equipment.



SWACO D-GASSER®

Operators frequently report saving the entire rental cost of a D-Gasser on a well in less than a day.
When mud is gas-cut, the D-Gasser saves money in many ways. It cuts time lost for circulating after trips. It reduces barite costs, it minimizes lost circulation costs and problems. It maintains mud pump efficiency and it actually makes possible the close control of mud weight and viscosity that results in faster drilling with increased safety.

CLAYJECTOR®

If you are using mud as heavy as 12 pounds per gallon, you can cut mud costs and increase drilling rate by using a Clayjector. This is a cyclone-type separation unit that is extremely effective at rejecting unwanted clays and retaining expensive barite.
In addition, since it makes possible the economical maintenance of a low-solids, low-viscosity mud, it actually permits a reduction in bit costs and drilling time.

D-SANDER®

The D-Sander greatly increases the life of mud pump parts and bits when sand or abrasive shale is being drilled. Since it removes virtually all sand-sized solids from the mud, excessive pump-parts and bit-nozzle wear — as well as many other problems — are avoided when a D-Sander is used. There is a size and type to fit every rig and drilling condition.

These descriptions tell just a few of the many ways you can cut costs by mechanical mud treating. For the full story on how you can profit, call your nearest SWACO representative or write us direct.

SWACO

SALT WATER CONTROL, INC.
1809 CONTINENTAL NATIONAL BANK BLDG., FORT WORTH 2, TEXAS
Telephone: EDison 2-4433 Cable Address: "SWACO" Fort Worth

LOUISIANA: New Orleans, Lafayette
OKLAHOMA: Oklahoma City
TEXAS: Houston, Corpus Christi, Fort Worth, Kermit
COLORADO: Durango

Why you should specify

AMERICAN IRON

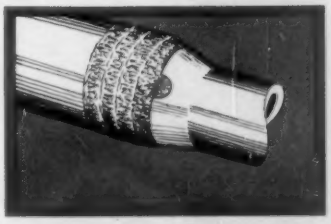
Flash Welded TOOL JOINTS

on your next string of drill pipe!

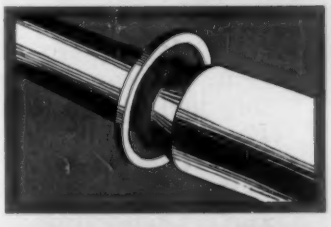
3 Reasons!

Use OPEN-HOLE Tool Joints for your light weight drill pipe

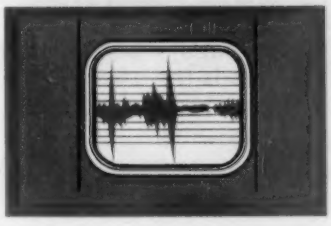
1 HARD METAL BANDS of Tungsten Carbide are available on all American Iron Tool Joints. They are applied PRIOR to heat treatment, which eliminates chipping, rapid wear and does not affect the physical metallurgy of the tool joint.



2 The "WEDDING BAND" is a heat treating process used by American Iron, which more than *doubles* the tensile-impact strength of the Flash Welded connection.



3 The REFLECTOSCOPE is a new electronic testing apparatus used by American Iron for inspecting the weld zone for inclusions and defects. This assures you of maximum performance from your string of Flash Welded Tool Joints!



AMERICAN IRON & MACHINE WORKS CO., INC.
MANUFACTURERS OF OIL FIELD EQUIPMENT
OKLAHOMA CITY

518 N. Indiana Avenue
Oklahoma City, Oklahoma

Another AMF Product
PETROLEUM EQUIPMENT

SPECIFY **AMERICAN IRON TOOL JOINTS**
on your next string of drill pipe
for real, economical **DRILL-A-BILITY**

New Drilling Detergent Saves Drilling Dollars

D-D®, Magcobar's new drilling detergent, is recommended only for operators and contractors who like money. Because, when you use D-D on your well, it's hard **not** to save money.

Look what D-D does. By reducing surface tension in water base muds, it speeds up the rate of penetration. What's more, it settles out sand, extends the use of low pH muds to greater depths, and reduces costs of chemical treatment.

The really big surprise about D-D is that so little does so much. Initial treatment is only ten gallons per 500 barrels of drilling fluid. Maintenance is two to six gallons per tour.

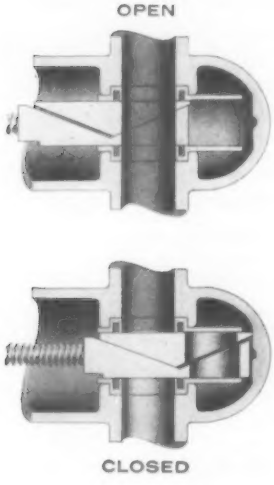
Like money? You can learn all about D-D by writing for the new brochure. Magnet Cove Barium Corp., P. O. Box 6504, Houston, Texas.

Another **Well Done** with Magcobar Technology

®Registered trademark, Magnet Cove Barium Corporation.

Magcobar
Complete
DRILLING MUD SERVICE

DRESSER INDUSTRIES, INC.
OIL • GAS
CHEMICAL
ELECTRONIC
INDUSTRIAL



Get the extra margin of control in W-K-M Multiple Completion Valves

Available in no other integral multiples, the famous W-K-M Parallel Expanding Gate lets you control the *seating force* as well as the action of opening and closing.

This extra margin of control lets you close the valve to *absolute shut-off* . . . open it until the gate assembly is sealed positively against the seats for *perfect through-conduit* flow. Result: *no* turbulence to cause erosion or abrasion.

The extra protection of W-K-M Integral Multiples is the most economical production insurance you can buy.

Types: Duals to 10,000 lb.; Duals with Cross to 5000 lb.; Triples to 10,000 lb.; Triples with Cross to 5000 lb.; Quadruples to 5000 lb.

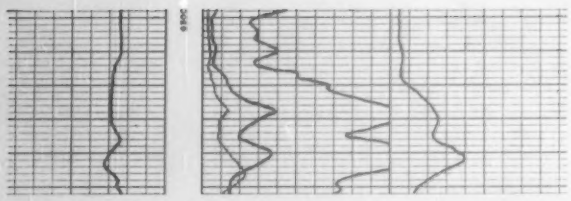
W-K-M

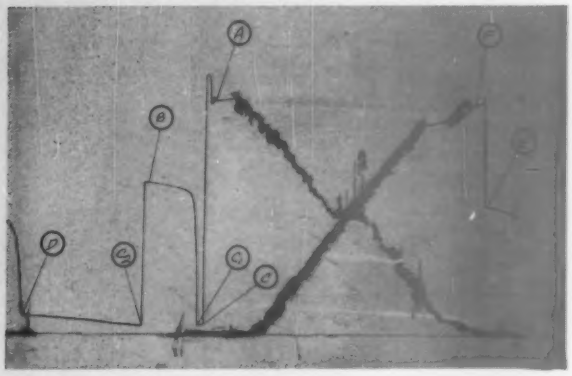
DIVISION OF ACF INDUSTRIES INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

6001

WHICH WELL WAS THE PRODUCER?

WELL "A"

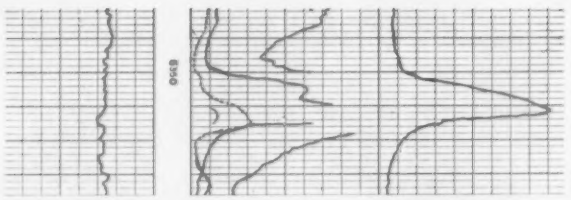


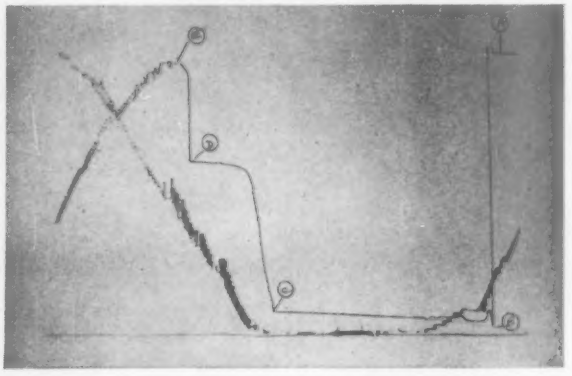


Electric logs on well "A" indicated fair to good permeability. Resistivity was indicative of fluid content. Cuttings showed a good oil stain on the interval *6312—6357*. Core analysis and log interpretation left considerable doubt as to whether the zone would be commercially productive. The section showed a good percentage of porosity, fair permeability and 10.6% oil/46.5% water content. To supplement existing data, Johnston Testers performed a three-hour Selective Zone Test on the sand and recovered 125 feet of oil and 700 feet of water.

Casing was set on the well and the zone perforated. The sand was acidized to stimulate production and improve oil/water ratio. Was this well a commercial producer?

WELL "B"





A slight oil show was noticed in cuttings from the sand at interval *5350—5370* shown on the above log. Logs which were run indicated low permeability at this interval. Core analysis verified the low permeability but showed a rather high percentage of porosity and 18.2% oil/36.5% water content. To supplement this data, Johnston Testers performed a four-hour Selective Zone Test and recovered 370 feet of oil and 180 feet of gas cut mud and water.

Casing was set and the zone perforated. The sand was treated to improve the flow characteristics and improve the oil/water ratio. Was this well a commercial producer?

Above Drill Stem Test information, test data and the fluid recovery, indicated a non-commercial producer on Well "A." Subsequent acidizing result was poor. The well was abandoned and plugged.

Drill Stem Test information indicated commercial production from Well "B." Well "B" became the producer, flowing in excess of 150 bopd.

You can save money by calling Johnston Testers before you set casing on your next well. Will it be a dry or producing well? A Johnston Drill Stem Test will tell!!

JOHNSTON TESTERS

Houston, Texas • Calgary, Canada

FALK and STEELFLEX are Registered Trademarks

Cut disconnect-reconnect time by as much as 50%

The FALK Spacer Coupling is specially designed for quick installation or removal *without disturbing the driving or driven unit.* This feature can save you up to 50% in disconnect-reconnect time when critical equipment—a process pump, for example—needs repair or replacement.

Here's another saving: with the FALK Spacer Coupling, you can quickly realign shafts *without the usual loss of operating temperature!*

And still another: you can remove or reinstall the FALK Spacer as a unit *without draining the lubricant.*

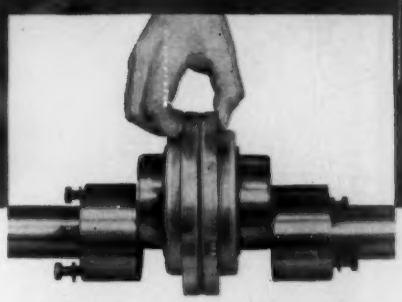
Because of its exclusive grid-groove Steelflex design, the FALK Spacer can accommodate residual misalignment—parallel, angular, or (most important) *both.* Also, it provides torsional resiliency that cushions shock and vibration. Thus it saves wear-and-tear on your connected equipment.

To prove these claims and enjoy these savings, install a FALK Spacer on one application—and see for yourself. Consult your FALK Representative or Authorized Distributor.

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

Representatives and Distributors in many principal cities.

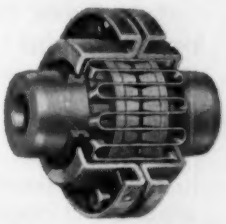


EASY AND QUICK TO INSTALL, DISCONNECT OR RECONNECT

First, mount shaft hubs to allow proper distance between hubs; then, align driving and driven units.

Second, compress Spacer to fit space between hubs and tighten cap screws to pull spacer hubs into the registered fit.

To disconnect, reverse the second step. No draining of lubricant necessary.

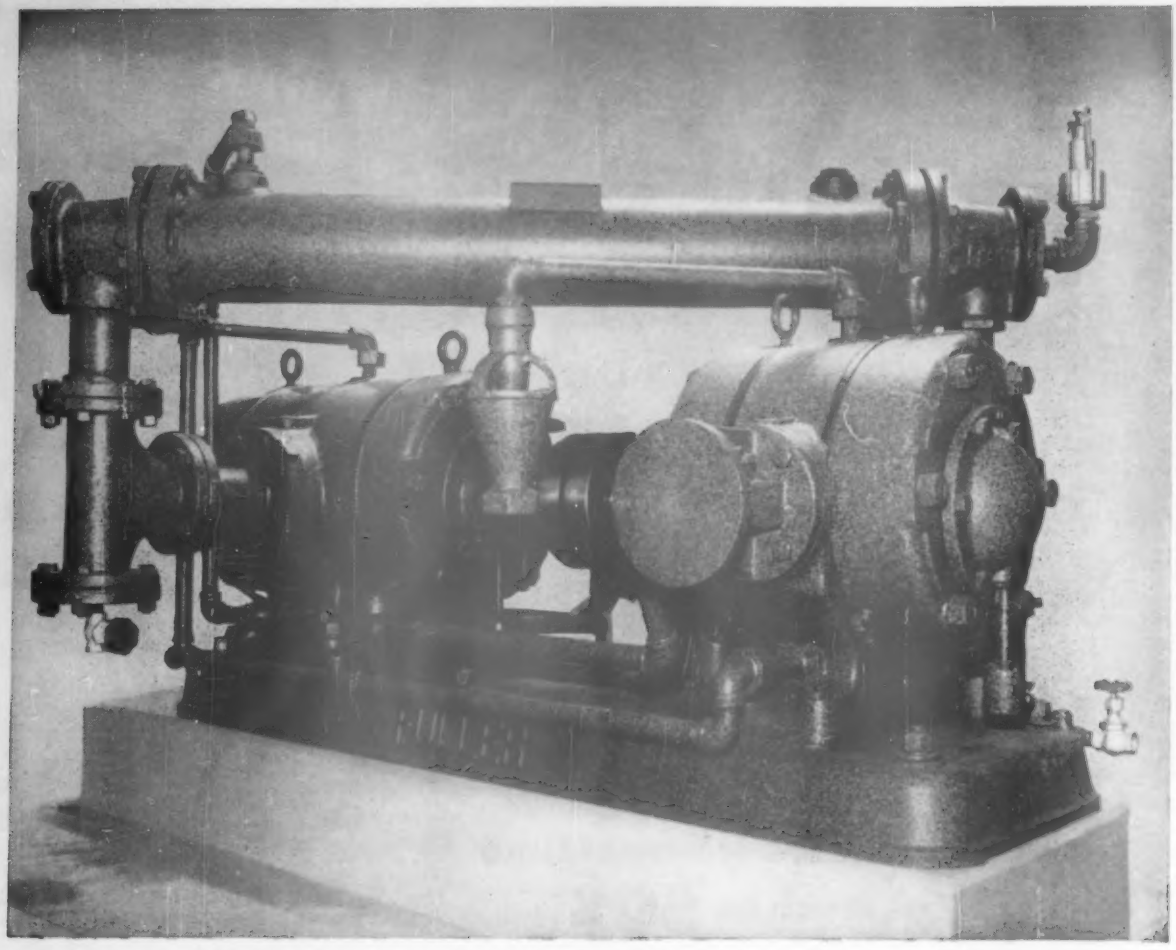


The heart of the FALK Spacer ...the basic Type F Steelflex

Write for Service Manual 4838

FALK

...a good name in industry



Fuller Compressors With Overhead Intercoolers Offer A New Dimension In Compactness

Fuller Rotary Two-Stage Compressors equipped with Overhead Intercoolers fill the bill where space may be a problem. These compressors produce from 30 to 3300 cfm, pressures to 125 lb. gage and can be readily installed.

These compact Rotary Compressors are vibration-free, thereby eliminating the need for involved and expensive foundations or structural modifications.

The Fuller rotary principle permits complete freedom of reciprocating parts—valves, crankshafts, pistons—cutting the need for frequent servicing and parts replacement. Minor maintenance is all the care indicated for years of serviceability.

For full details on the maintenance-free economy and high performance of Fuller rotaries, write today for comprehensive, illustrated Bulletin C-5A. 2626 C359

See Chemical Engineering Catalog for details and specifications.

FULLER COMPANY GENERAL AMERICAN TRADE MARK

FULLER COMPANY
132 Bridge St., Catasauqua, Pa.
Subsidiary of General American Transportation Corporation
Offices in Principal Cities Throughout the World

Fuller
pioneers in harnessing AIR

DU PONT *Petroleum Chemicals* NEWS

Number 107 in a series of bulletins for the Petroleum Industry

MARCH • APRIL 1961

TETRAMIX* offers new flexibility in choice and use of lead antiknocks

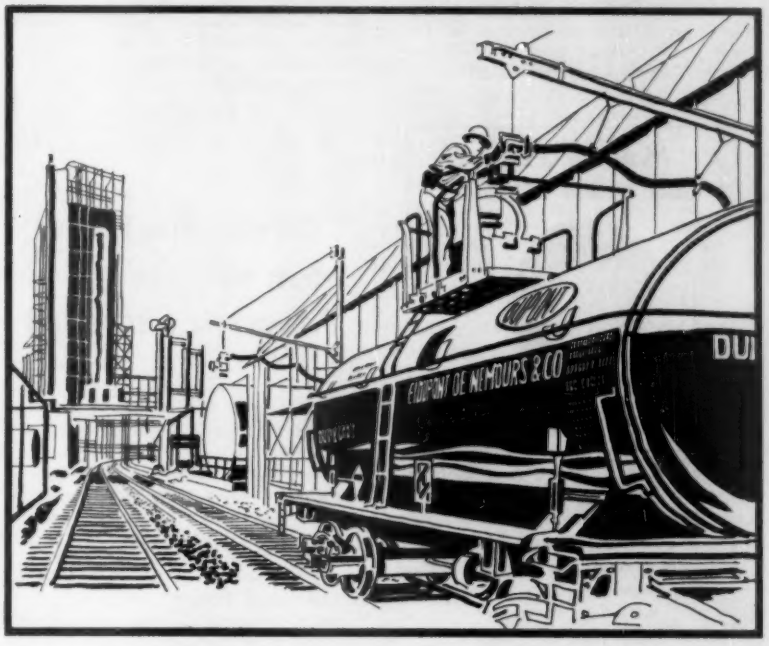
In the few brief months since the introduction of Du Pont TETRAMIX antiknock compound, refiners have found that it offers a new degree of flexibility in their choice and use of lead antiknocks. For example, while its effectiveness varies with gasoline composition (as is true with other antiknocks as well), TETRAMIX is generally effective in low, medium and high dosages.

Results of tests to date indicate that TETRAMIX is also a more effective antiknock in some fuels than either tetraethyl or tetramethyl lead —that is, a given octane number can, in such fuels, be obtained with lower concentrations of TETRAMIX than with TEL or TML. Being a mixed lead alkyl, TETRAMIX brings to many gasolines the best qualities of TEL and TML.

Based on this refining flexibility and the potential savings it offers in blending gasolines to desired octane numbers, TETRAMIX antiknock compound has already won refiners' acceptance. With commercial quantities available, now is the time for *you* to investigate the potential advantages of TETRAMIX.

Because you have a choice of lead antiknocks at Du Pont, you'll get impartial help in selecting the best one for *your* gasoline stocks. Your Du Pont Petroleum Chemicals Division representative can assist you in evaluating the relative merits of TEL, TML and TETRAMIX.

*Trademark



Commercial shipments of Du Pont TETRAMIX are now rolling to refiners.

All in the family

TETRAMIX, Du Pont's new lead antiknock compound, is a combination of all possible tetramethyl-ethyl lead compounds. It provides the best qualities of both TEL and TML in a single additive.

Announced in the fall of 1960, TETRAMIX represents the latest in a series of Du Pont petroleum additive developments that dates back to the commercial introduction of TEL in the early 1920's.

Now . . . 4,507 motorists in a nutshell

The "Summary Report" of the Du Pont "Profile of the Motorist" study is soon to be published. This new booklet will give you a nutshell version of the results of the most extensive survey ever made of the driving-and-buying American public.

In handy, concise form, this new publication will contain answers to questions about how people react to price wars, give-aways, trading stamps, regular vs. premium gasolines, TBA

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DUPONT *Petroleum Chemicals* NEWS

CONTINUED

4,507 motorists

purchases, credit cards, vacation driving and daytime TV . . . and many other facts that further define and analyze the motorist and the market he represents.

In the "Profile of the Motorist" study itself, 4,507 motorists were interviewed in marketing areas from coast to coast. The broad findings, trends and many cross-tabulations will be published in the "Summary Report." Comparisons with earlier DuPont surveys are also to be included.

Copies of the "Summary Report" will be available about April 1. For your copy or for information on the study itself, contact your DuPont Petroleum Chemicals representative.

MANAGER
GULF COAST REGION

CHARLES D. TOWERY, Manager of the Gulf Coast regional office for DuPont Petroleum Chemicals, has been associated with DuPont since 1947.

Starting as a sales service representative for the Petroleum Chemicals Division in the Gulf Coast District, he later was manager of the Mid-Continent region before moving to his present position.

Prior to coming with DuPont, Mr. Towery was employed by Bethlehem Supply Company of Houston, the Gulf Oil Corporation and the Pure Oil Company. He also served as a petroleum advisor in the U. S. Bureau of Ships during World War II.

He received a Bachelor of Science degree in Chemical Engineering from Texas A. & M. College in 1932. He and his wife live in Houston with their four children.

The many DuPont services are available to refiners and marketers in the Gulf Coast area through Mr. Towery's office – to aid in the solution of petroleum additive problems.

Color gives fuel oil a new selling advantage

Oil companies know that the subtle differences between competitive petroleum products often can mark a wide variation in their sales value to consumers.

One of these factors in fuel oils, for example, is the very appearance of the product. Consider the relative sales appeal of fuel oil in its normal state versus the same oil after a distinctive color has been added to it. Perhaps the burner is unaware of the difference, but marketers and consumers alike can recognize a difference. Such a distinction may be the sales advantage you seek.

To this end, DuPont petroleum dyes offer you several built-in features: an unlimited choice of colors, color-fastness for lasting value, availability in powdered, flaked or crystalline forms; rapid deliveries; experienced technologists to advise on color selection, application and use.

Your DuPont representative will gladly offer this advice—or provide you with our latest booklet on DuPont Petroleum Dyes.

"Down the Road" now appearing on America's screens

"Down the Road," the CinemaScope movie sponsored by DuPont to stimulate interest in auto travel, is now appearing in movie theaters across the country.

Narrated by Lowell Thomas, the ten-minute color featurette is an adventure in itself – a thrilling visit by automobile to all corners of America, from the Painted Desert to New England, from the sands of Daytona to the mountains of Canada.

In sponsoring "Down the Road" DuPont is promoting expansion of the demand for petroleum products by encouraging a greater interest in the heritage and beauties of America—and the ease and comfort with which they are available via automobile.

Motorists in *your* marketing area will soon be seeing "Down the Road." If you are interested in tying in with the travel promotion value of this film, your DuPont Petroleum Chemicals representative can give you data on local bookings.

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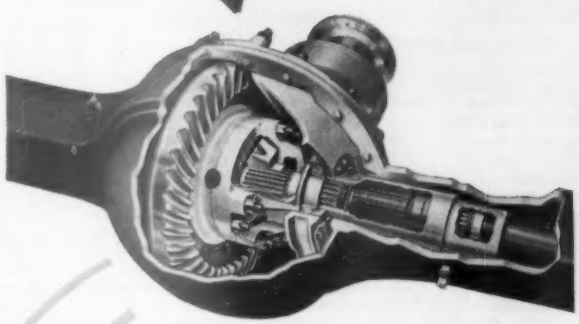

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Dear Sir:

Vigorously protest statement that Oxy Catalyst is associated with Universal Oil Products Co. on development of catalytic converter. Statement under picture Page 115 your February 20 issue. No relationship exists between the two companies in any field.

Catalytic muffler which we will present in California is a joint development between this company and a member of the Automobile Manufacturers Association. Request correction earliest possible date.

Gordon P. Larson
Oxy Catalyst, Inc.
Berwyn, Pa.

Pennies from Harvard

Dear Sir:

Your article "Pennies From Harvard" (OGJ, Feb. 13, "Journally Speaking," p. 41) troubles me because the depicted events are symptomatic of several major problems.

At the root of these problems lies a lack of interdisciplinary communication on one hand (semantics) and flagrant disciplinary egotism on the other. Discipline is used here in the sense of any of the main subject headings under which college students "major." Each of the above augments the other.

In reference to Dr. Joskow, he has both an intradisciplinary and an interdisciplinary fallacy in his argument. The intradisciplinary fallacy seems to have been pointed out nicely by the unnamed "Harvard Professor."

The interdisciplinary fallacy seems to be founded on a complete lack of both knowledge and understanding of earth science. This fallacy has been masked by a masterful job of sidetracking the evidence through a bit of mental legerdemain.

As an analogy let us say that an electrical industry representative has published a statistic saying that the **average** life of a light bulb is 1,000

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WRITE FOR BULLETIN 610

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hours. Life in this instance means production of light for that period. This can be a valid statistic. The number of light bulbs that are broken or were rejected by the manufacturer, or do not work, also may be worked out as valid statistics.

As long as you stay within operating electrical systems, these statistics should hold. The statistics are, however, meaningless when there is no electricity. This is the fallacy of Dr. Joskow. The oil statistic has proven valid in areas considered oil's habitat, but oil is not unlimited nor does it accumulate everywhere. The analogy should make the fallacy obvious, particularly as backed by known principles and facts of earth science.

Now that this is off my chest, I will relax until the next issue of The Oil and Gas Journal.

John E. Husted, Head
Mineral Engineering Group
Georgia Institute of Technology
Engineering Experiment Station
Atlanta

Survey of air pollution

Dear Sir:

The "Survey on How Refiners Are Combating Air Pollution" by D. H. Stormont (OGJ, Feb. 20, p. 105) was read with interest.

We note that considerable emphasis has been placed on economics. It appears that costs of the oil refining industry air pollution-control program are stressed more in this presentation than in your report of February 1958. This undoubtedly is of vital importance to your management readers who must decide how their companies will spend funds for an air pollution - control program.

The article states that capital expenditures should be taken only as a guide and not as a gage to air pollution - control accomplishments. However, since several comparisons are made to prior years, the table on pages 106-107, where costs of 35 companies in 1956-57 are compared with 56 companies in 1958-60, may be misleading to some of your readers. The emphasis of the 4-year cost of control equipment at one California refinery also creates a rather harsh impression of Cali-

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fornia's air pollution-control programs.

Planned payout is a relative item and the basis of return should be indicated. Intangible items such as decreased fire hazard, reduced corrosion, increased overall refinery efficiency and better working conditions all add to the payout factor. Some Los Angeles refiners have equated these intangibles to a significant cash value.

Your data on sulfur recovery in Los Angeles County do not agree with our data. APCD statistics for July 1960 show about 675 tons per day of sulfur (as SO_2) removed from refinery effluent gases by controls and 460 tons per day of sulfur (as SO_2) prevented from entering the atmosphere during periods of restrictions on fuel oil burning.

The total amount of sulfur (as SO_2) discharged to the atmosphere from all sources when there is no ban on fuel oil burning is 585 tons per day. Therefore, the amount of sulfur recovered by refinery controls would represent, not 1%, but more than 50% of the total sulfur oxides that could be released as air pollution in Los Angeles County.

Carbon monoxide boilers were installed on regeneration equipment of catalytic cracking units primarily by the refiners to utilize the combustible carbon monoxide content of regeneration flue gases for steam generators, not for hydrocarbon removal. Hydrocarbon control was a fringe benefit as was the control of cyanide and ammonia gases. We are, nevertheless pleased to have these emissions controlled, whatever the reason, without resorting to legislation.

S. Smith Griswold, Air Pollution Control Officer
By Robert L. Chass, Director of Engineering
Air Pollution Control District
County of Los Angeles

Costs may not be the best yardstick for measuring the progress of refiners in controlling air pollution nationally. But, considering the variations in the need for control and the lack of information on amounts and type of pollution being controlled in some areas, cost becomes the only basis for comparison. The reference concerning amount of sulfur released into the atmosphere was made to show that the amount of sulfur being recovered is only an extremely small part of the total being released to the atmosphere from all sources. Some of these sources never can be controlled.—Ed.

It would have been better

Dear Sir:

Your editorial in The Oil and Gas Journal of February 27 on resid controls (p. 53) represents the thinking which I have been expressing at meetings of the import policy committee of IPAA for the past several years.

Actually, the domestic producer gains little by control of resid imports, provided such imports are not permitted to be reprocessed in place of crude oil. I have contended that we have eight New England states that are unfriendly on that account, when they could certainly be helpful, especially on depletion and other important things affecting the domestic producer.

There is no rhyme or reason for us to be fighting the battle of Coal. However, there are a few inland domestic refiners that seem to be

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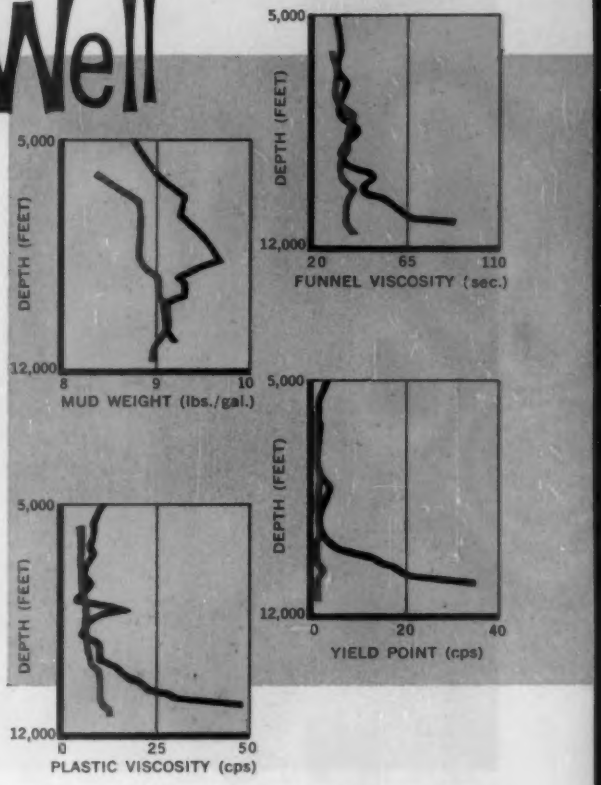

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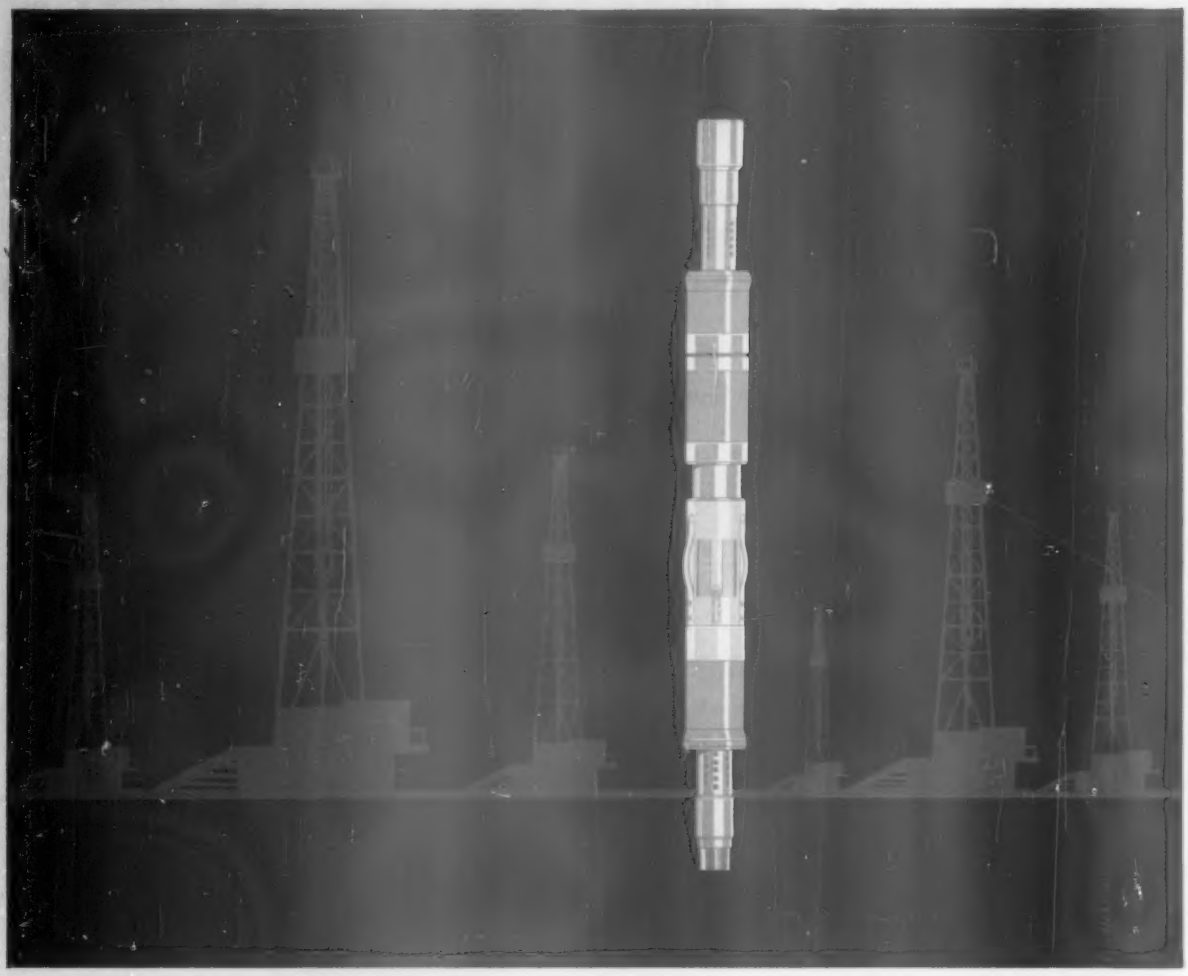

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able to prevent a change in IPAA's import policy as to resids.

How much better it would have been for us to gracefully go along on decontrol of resids, rather than having it done by the new administration with us in opposition!

Maston Nixon
Southern Minerals Corp.
Corpus Christi, Tex.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

MARCH

27-28 University of Wichita, School of Engineering, third annual production institute, university campus, Wichita.
27-29 Midwest Gas Association, annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha.
27-29 Society of Petroleum Engineers of AIME, Saudi Arabia section, regional meeting, Dhahran, Saudi Arabia.
27-31 Instrument Society of America, symposium on temperature measurement and control in science and industry, Veterans Memorial Auditorium, Columbus, Ohio.
28 Canadian Petroleum Association, annual general meeting, Hotel Palliser, Calgary.
28-29 University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman.

APRIL

4 Instrument Society of America, New Jersey section, annual symposium on electronic process instrumentation, Hotel Essex House, Newark, N. J.
4-5 University of Kansas, gas compressor institute, Liberal, Kans.
5-6 Third annual symposium on pilot plant and process automation, Ambassador Hotel, Los Angeles.
5-7 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Mayo Hotel, Tulsa.
6-7 University of Oklahoma, School of Mechanical Engineering, short course on industrial engines, University of Oklahoma, Norman.
6-8 Texas Oil Jobbers Association, Petroleum Marketers Association, convention and trade show, Baker Hotel, Dallas.
8-12 Petroleum Equipment Suppliers Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.
9-11 Society of Exploration Geophysicists, fourteenth annual midwestern exploration meeting, Skirvin Tower Hotel, Oklahoma City.
10-11 American Society of Mechanical Engineers, maintenance and plant engineering conference, Bancroft Hotel, Worcester, Mass.
10-12 Western Petroleum Refiners Association, annual meeting, Granada Hotel, San Antonio, Tex.
10-13 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Jung Hotel, New Orleans.
11-13 Petroleum Industry Electrical Association and Petroleum Electric Supply Association, annual conference, Moody Convention Center, Galveston, Tex.
12-14 Investment Bankers Association of America, annual convention of the Texas group, Shamrock Hilton Hotel, Houston.
14 American Institute of Chemical Engineers, St. Louis section, third annual symposium, Coronado Hotel, St. Louis.
14-15 Tulsa Geological Society, Fort Smith Geological Society, joint field trip to the Arkoma basin, registration, Goldman Hotel, Fort Smith.
17-19 Instrument Society of America, symposium on instrumental methods of analysis, Shamrock Hilton Hotel, Houston.
18-20 University of Oklahoma, southwestern gas measurement short course, North Campus, University of Oklahoma, Norman.
19-20 University of Tulsa, fifteenth annual conference of accountants, University campus, Tulsa.
19-20 National Petroleum Association, semi-annual meeting, Hotel Sheraton-Cleveland, Cleveland.
20-21 Society of Petroleum Engineers of AIME, East Texas-Louisiana-Arkansas gas-technology symposium, Tyler, Tex.
20-21 Texas Technological College, annual West Texas oil lifting short course, Lubbock, Tex.
20-22 Illinois Society of Professional Engineers, annual convention, Peoria, Ill.
24-26 Southern Gas Association, meeting, New Orleans.
24-27 American Association of Petroleum

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Geologists, Society of Economic Paleontologists, and Rocky Mountain section of AAPG, annual meeting, Denver Hilton Hotel, Denver.

26-28 American Petroleum Institute, Division of Transportation, pipeline conference, Chase-Park Plaza Hotel, St. Louis.

27-28 Rocky Mountain Oil and Gas Association, midyear meeting, Northern Hotel, Billings, Mont.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Lake Murray Lodge, Ardmore, Okla.

29 American Institute of Chemical Engineers, Oklahoma state meeting, University of Tulsa, Tulsa.

30-May 2 Independent Petroleum Association of America, midyear meeting, Roosevelt Hotel, New Orleans.

30-May 3 Liquefied Petroleum Gas Association, convention and trade show, Conrad Hilton Hotel, Chicago.

MAY

2-4 Purdue University, School of Civil Engineering, sixteenth industrial-waste conference, Purdue Memorial Center, Lafayette, La.

3-5 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone-Henning Hotel, Casper, Wyo.

4-5 Society of Petroleum Engineers of AIME, oil recovery conference, Midland, Tex.

4-5 Pacific Coast Gas Association, Inc., transmission conference, Biltmore Hotel, Santa Barbara, Calif.

4-5 Illinois State Geological Survey, Illinois Basin chapter of AIME's Society of Petroleum Engineers, biennial petroleum engineering conference, University of Illinois campus, Urbana.

5-7 Indiana Geological Survey, Indiana Department of Conservation, University of Indiana department of geology, tenth geologic field conference, stratigraphy of the Silurian rocks of northern Indiana, Marion, Ind.

7-10 American Institute of Chemical Engineers meeting, Sheraton-Cleveland Hotel, Cleveland.

8-11 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.

8-12 American Gas Association, distribution and production conference, Sheraton Hotel, Philadelphia.

9-11 Western Joint Computer Conference and Exhibit, Ambassador Hotel, Los Angeles.

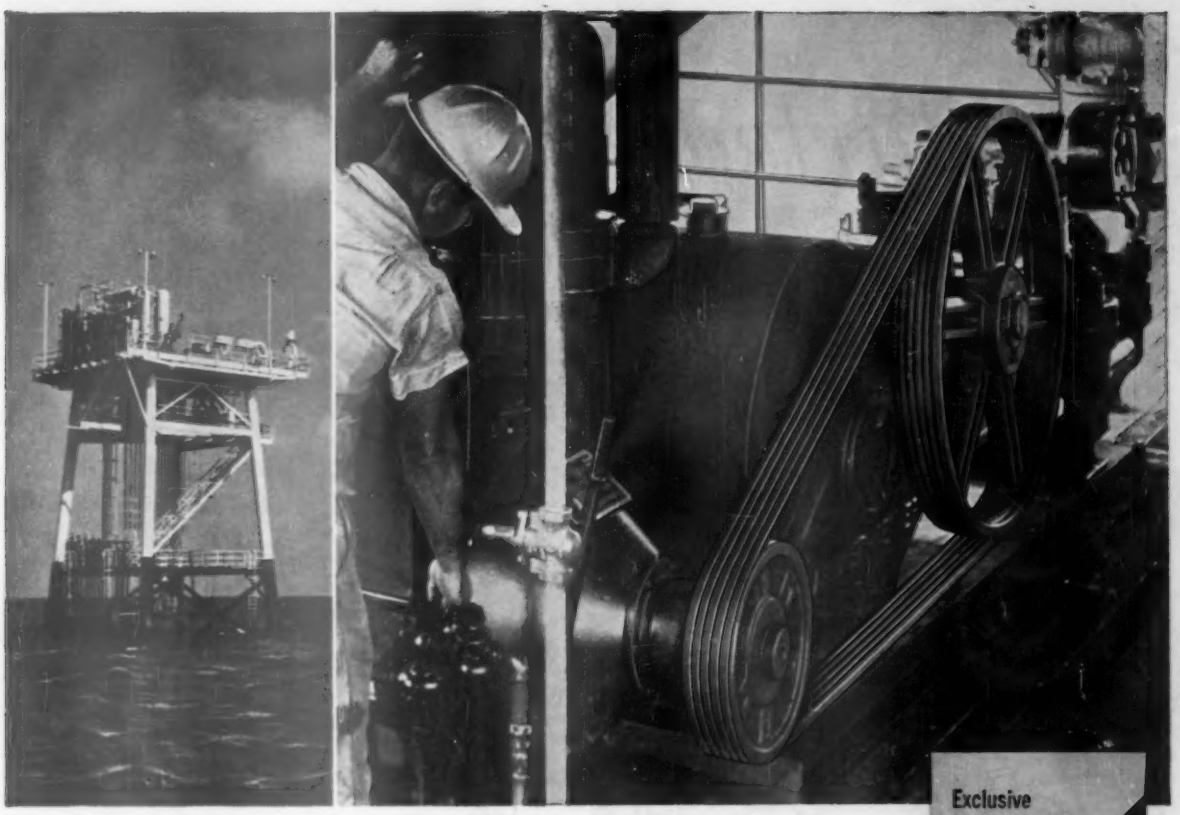
10-12 American Society of Mechanical Engineers, production engineering conference, Royal York Hotel, Toronto.

10-12 Canadian Institute of Mining and Metallurgy, oil and gas division, and Calgary and Edmonton petroleum engineering sections of Canadian Institute of Mining and Metallurgy and American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, McDonald Hotel, Edmonton, Alta.

11-12 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

11-12 Texas A. & M. College, thirteenth oil recovery conference, College Station, Tex.

12 Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Tex.



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There is a Gates Field Engineer serving your area. To contact him, and to get complete information about the Super HC Drive, call your nearby Gates-stocked supply house.

The Gates Rubber Company, Denver, Colorado BP-5

Exclusive design features include:

precisely engineered arched top, concave sidewalls, Flex-Weave cover, super strength tensile construction.

Gates Super HC Drive saves space, weight and money

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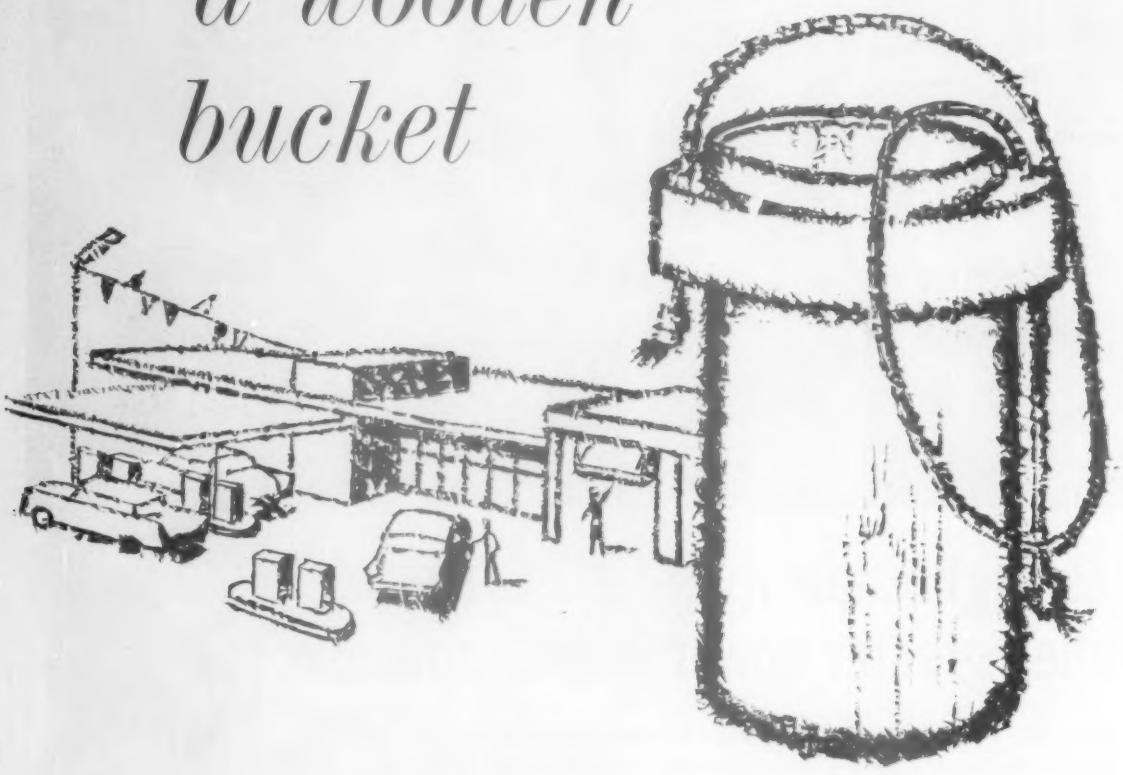
Building the future on 50 years of progress.

Gates Super HC V-Belt Drives

Number 4 of a Series
TELL THIS PETROLÆUM INDUSTRY FACT TO YOUR NEIGHBOR

It started with a wooden bucket



A long the early rutted trails of Pennsylvania rolled the Conestoga wagons with a wooden tar-bucket slung from the rear axle. Teamsters swabbed smoking hubs with a mixture of tar and lard, or with petroleum seepage when they could find it. That tar-bucket is the ancestor of the service stations that today pump 42 billion gallons of motor fuels into passenger cars and trucks each year.

This necessity is taxed more than most luxuries; Federal and state taxes add nearly 50% to the price of gasoline. The petroleum industry has developed better fuels at lower actual cost, but taxes have eliminated any benefit to the consumer. Since 1925, *taxes* on gasoline have increased 380%. The average price of gasoline (not including taxes) has increased *only 1%* during the same period. No other industry has made so many product improvements with so small an increase in actual cost during this period of declining dollar purchasing power.

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6103

50 years ago

March 30, 1911

Five-year rampage of Caddo Gas & Oil Co.'s notorious wild, cratered gas well in the Caddo field of northwestern Louisiana ends. Relief wells drilled on edge of crater drain pressure and kill burning cratered blowout. Before blowout, the well, flowing 5 M.c.f.d., supplied Shreveport with gas.

New price postings raise Oklahoma, Kansas, and North Louisiana crude oil from 44 to 50 cents; North Texas to 53 cents; Pennsylvania grade to $1.30; and Gulf Coast from 67 to 72 cents.

John Fertig, pioneer oil man, and driller of the famous "fountain well," in Venango County, Pennsylvania, dies. He had been in the oil business continuously since 1860, and was one of the most prominent operators in eastern fields.

25 years ago

March 26, 1936

Galveston and associated bays on Texas Gulf Coast are opened for oil and gas exploration. State starts awarding of leases to water beds totaling 184,451 acres. Leases totaling 26,880 acres in Gulf of Mexico along coast of Bolivar Peninsula also are included.

Significant oil-field development during the week, one of the busiest in many months, included completion of the discovery well of Talco field, in Titus County, East Texas; discovery of a high-gravity oil pool in the Lockridge, or Sandy Point, area of Brazoria County, Texas Gulf Coast; a Big Lime strike in the Tubbs-Sand Hills area of Crane County, West Texas; opening of a relatively shallow Dakota-sand field in Archuleta County, Colorado; and a prolific Viola lime discovery in Lerado pool, in Reno County, Kansas.

10 years ago

March 29, 1951

Gulf-Michigan Gas Transmission Co. is organized to build a $90,000,000, 700-mile, 30-in. natural-gas line from Monroe, La., to Michigan City, Ind. William G. Marbury, president of Mississippi River Fuel Corp., is president. E. P. Kramer is vice president.

Colorado adopts new oil and gas-conservation law. New five-member oil and gas-conservation commission replaces old three-member commission with greater powers to regulate drilling and production. Authority to order pooling of interests in drilling units.

First oil production in North Dakota indicated as Amerada Petroleum Corp. starts testing its 1 Iverson wildcat at Beaver Lodge, in Williams County. Its Madison pay is perforated at 11,708-20.

JOURNALLY SPEAKING

New Yorker's View of Oil

ON THE THEORY that every knock is a boost, this is a plug for The New Yorker magazine which is currently serializing what it calls a profile of Texas.

Last week's installment was on oil. Oil men probably won't like it very well, not so much for what it says but because of its supercilious tone. The author views the oil business with, in his own words, an air of amused condescension. He obviously did considerable research, and got most of his facts fairly straight. He apparently thought he was being quite impartial and objective. But the information he elected to present and the manner in which he presented it are not exactly in the pattern of the oil industry's publicity writers.

In large measure oil men are themselves to blame for any warped impression this author, or any Easterner for that matter, may have got. They are hoist with their own petard. He repeats their own phrases in ways that make them look just a bit ludicrous.

For example, he found that many oil men refer to their industry as the oil game. This, then, becomes the theme of his article. He treats the business as a game all the way through, and refers to oil men as players or operators—with the implication that an operator may be something like the proprietor of a gambling casino.

He also observed that oil men talk a distinctive lingo that outsiders can't understand; that they are impatient with people who criticize the oil industry and are loath to take the trouble to explain it; that they prefer to deal with and associate with only other oil men; and that they care little about the public and prefer to live in privacy.

Since there is more than a little truth in those observations it should be no cause for wonderment that the public sometimes gets a slanted impression of the oil business and that even conscientious writers, hitting the industry cold, come away with only half-truths.

Of course nobody could write a piece about Texas oil without mentioning depletion, and this New Yorker writer devotes several columns to the pros and cons in what appears to be a real effort to present both sides. He does endorse the principle of the depletion allowance, yet he expounds at length and almost in awe on its undoubted attractions to high-tax-bracket investors.

But why the rate should be 27½% stumps him. He calls it "a figure that oil men are fond of investing with a sacred quality, like ten in connection with commandments." And when he dismisses oil's defense of that rate as "a veritable labyrinth of arguments and rationalizations of varying degrees of ingenuity," perhaps that again can be credited to the industry's notorious inability to make itself understood by laymen.

Likewise in discussing proration he is most impressed by its functioning to prevent a price-lowering surplus and barely mentions that oil men claim that its greatest importance has something to do with conservation. Proration's effect on production is easy for anyone to see; conservation is a complicated subject, almost as difficult to explain as depletion.

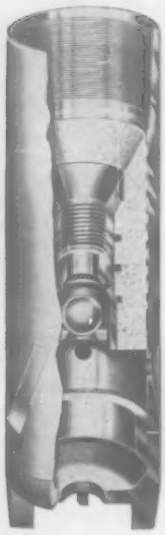
So it is throughout the article. The things about oil that most readily greet the eye get the most attention. For instance, he is so impressed with the typical oil man's casualness (making a deal by 'phone instead of having lawyers draft a contract) that he leaves the impression that the whole industry is run in an astonishingly sloppy manner.

And while he frequently refers to the failures and losses, he is enormously intrigued by the rags-to-riches biographies of a few lucky wildcatters.

But before oil men get too mad at the way New Yorkers see them, perhaps they should ask themselves what pains they take to represent themselves in a different light.

—Henry D. Ralph

DUPLEX



Baker DUPLEX Cement Wash-Down Whirler Float Shoe, Product No. 360

LINER CEMENTING SHOE

WHAT YOU CAN DO WITH BAKER DUPLEX EQUIPMENT:

- You can successfully cement liners, combination strings, and perform certain types of two-stage cementing.
- You can cement blank sections of pipe below a perforated section, without any need to use auxiliary equipment.
- You can wash out cavings ahead of the string when setting a perforated liner. Without DUPLEX Equipment you can circulate only through the topmost perforations—with DUPLEX you can circulate clear to bottom.
- You can use DUPLEX equipment with or without a liner hanger.
- You have complete control of the liner at all times when DUPLEX Equipment is used. The liner can be raised or lowered, and is positively held down in place while cementing.
- *Ask your Baker Representative to tell you about other applications for* DUPLEX *Equipment; or write to Baker Oil Tools, Inc., P.O. Box 2274, Terminal Annex, Los Angeles 54, Calif.*

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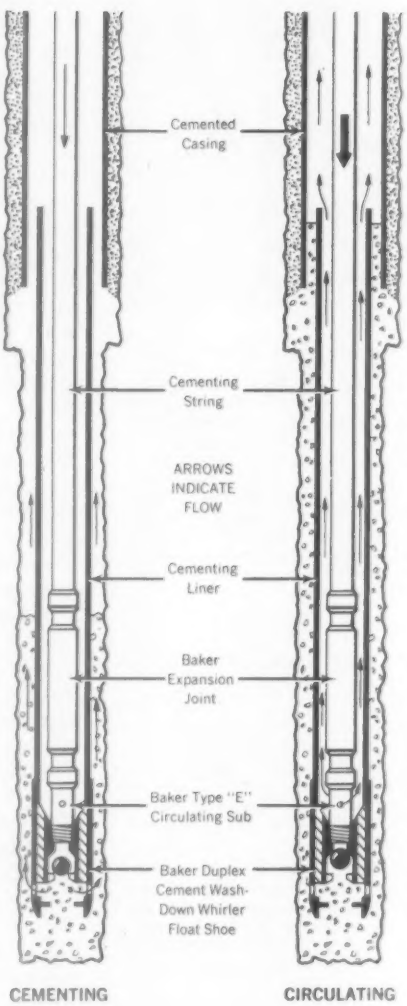
BAKER DUPLEX

LINER CEMENTING SHOES AND COLLARS

Typical Use of DUPLEX Equipment

The drawings below illustrate a simple lap-type liner cementing job. The cementing string is connected to a left-hand thread in the top of the DUPLEX Shoe, and carries the weight of the liner as it is run in. The back-pressure valve prevents any flow-back of the cement slurry placed outside the liner. Excess cement is washed out through the circulating sub, after dropping a buoyant tripping ball to open the ports. The cementing string, expansion joint and sub are disconnected, by rotating to the right, and removed from the well. The inside of the liner is left clean and free from cement.



Here's a guide to oil's spring operating level

NOW THAT THE SUN has crossed the vernal equinox the industry should make careful plans for its operations during the second quarter.

Demand was disappointing in the first quarter. Despite some spectacular blizzards, degree-days were below normal and consumption of petroleum products was less than had been anticipated.

But refiners reacted to the storms by boosting runs to the highest levels in history and keeping them high through January and February as though they thought spring would never come.

AS A RESULT, the first quarter is ending with product stocks about 20,000,000 bbl. higher than they should be for comfortable operations. Refinery runs are normally lowered in the second quarter and yet stocks usually increase about 20,000,000 bbl. during the period.

This year the second quarter's normal addition to stocks has already been achieved. This means that runs must be cut more than normal in order to restore a balance.

During the past 2 weeks many refiners have announced reductions in runs. Perhaps some feel a bit contrite about their midwinter exuberance. Perhaps some announced only reductions they had scheduled months ago. Perhaps some are really making a sacrifice for the good of the industry. The figures will tell.

Refinery runs averaging 7,725,000 bbl. per day during April, May, and June will meet forecast demand and maintain stocks at about current levels, thus entering the summer in fair shape.

This would be a cut of more than 500,000 bbl. per day below first-quarter refinery runs. It works out to 78% of the API figure for operable capacity, whereas during the first quarter the nation's refineries ran at 83% of capacity.

Week by week, as the API figures are released, it will be easy to see how closely actual runs are approximating this estimate that 7,725,000 bbl. daily or 78% of capacity is an adequate operating level. If they average much above that, look for distress stocks and more price wars.

THIS GUIDEPOST of 78% of capacity is a national average only. Some regions and some companies will have good and legitimate reasons for exceeding it. But big refiners who consistently run far above it may be under suspicion of contributing unduly to a nationwide accumulation of excess stocks of refined products.

The real proof that an individual company, large or small, has run too much comes when it has a substantial volume of products beyond its normal market outlets and dumps these at less than prevailing prices.

Of course no refiner ever admits to this condition. But, obviously, somebody has been running too much. And until there is a better yardstick, the desirable national operating rate is a rough but useful guide.

These seven rock bits were used to drill below 25,000 feet in the world's deepest well. The Hughes Tool Company has specified AISI 4815 since 1934 for the cones of its rock bits.

World's deepest well drilled with nickel steel rock bits

AISI 4815 nickel steel keeps drilling costs down—even at 25,340 feet.

Almost 5 miles straight down. That's where you'll find the bottom of Phillips Oil Company's Pecos County University EE-1.

AISI 4815 nickel steel, carburized and heat treated to produce a hard case and tough core, was used to withstand the punishing abrasion, high stress, and heavy impact encountered in drilling the world's first well below 25,000 feet.

Lower Drilling Costs. However deep you drill, remember that AISI 4815 steel (3½% nickel) provides the strength and toughness for long bit life in the most severe applications. AISI 4815 nickel steel rock bit drill cones deliver more hole per bit—and lower drilling costs.

Less replacement, Less downtime, More savings. That's what you get when you depend on nickel steel for demanding oilfield-product performance.

THE INTERNATIONAL NICKEL COMPANY, INC.

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Phillips Petroleum Company's University EE-1, Pecos County, Texas. Hughes Tool Company's AISI 4815 nickel steel rock bits were used on this job. Hughes' nickel steel rock bits have drilled the equivalent of over 50 times through the earth.

INCO NICKEL

NICKEL MAKES STEEL PERFORM BETTER LONGER

How Landis Plans to Overhaul FPC

James M. Landis, the President's adviser on regulatory agencies, discloses just what he has in mind for improving and speeding up agency work, especially the FPC's. This exclusive tape-recorded interview was obtained by Journal Washington editor Clyde La Motte.

Question: Mr. Landis, as a result of your intensive study of the federal regulatory agencies, what do you consider are the most serious problems they face?

Answer: I would say the pileup of cases, the outright mishandling of things in some instances, and the failure of agency heads to formulate broad, clear-cut policies.

Q. Now the big question, sir. How can the logjam of cases be broken, specifically at the Federal Power Commission?

A. Well, I think there are two principal possibilities. One would be the exemption of the small producers from direct federal control.

The other would be eliminating some of the procedures involving less important aspects of granting pipeline permits.

Now about the first possibility. Figures that I have been given indicate that perhaps even more than 85% of the applicants for rates are the small people, and that they in turn represent less than 15% of the total production of natural gas.

Now if you exempt these small producers, it is my belief—and this belief is shared by others I've talked to—that this would not really affect the price of gas.

It is the price that is establishd for the large producer that becomes the field price anyway. The little fellow doesn't get more, probably can't get more.

So the small producer with only a few million cubic feet of production can't really affect the price situation. Yet, small producer cases now clutter the docket of the commission.

Q. About the larger producers who would not be exempt, how would they be regulated? On a utility-type cost basis?

A. I don't hold an opinion on that. I'm not an expert in that field.

But I do have an opinion that vigorous enforcement of some type of formula with regard to the cases of those people that are left to be regulated—and there would only be about 250 to 270 of them—could clean up this situation within a very reasonable time.

Q. In some cases you have been highly critical of FPC for its failure, as you see it, to tie prices to producer costs. Yet in the Phillips case decision FPC said that it used this method only to find that prices based

Landis Favors These Changes:

- Exempt the small independent natural gas producers from regulation. (The cutoff point probably would be production of 2 billion cubic feet annually.)
- Have a definite formula for regulating the large producers, thus speeding up the disposition of their cases.
- Enlarge the FPC, and split it into two panels. One panel would handle electric rates, the other gas matters. The chairman would be in charge of both panels, and take part in their work as he saw fit.
- Have an "overseer" to keep the President posted on any breakdown in regulatory efforts in any of the agencies.
- Get legislation, if needed, to help improve and speed up regulatory agency action.

Landis has held several agency posts

THE MAN President Kennedy selected to study the federal regulatory agencies, James M. Landis, has had years of experience in the field.

He was appointed to the Federal Trade Commission in 1933 and later in the New Deal was chairman of the Securities Exchange Commission.

In 1946 he left his post as dean of the Harvard Law School to accept an appointment as chairman of the Civil Aeronautics Board.

Landis is now serving as special assistant to the President.

on actual costs would have been higher than the rates Phillips had proposed. What is your comment on that?

A. I think there is some disagreement with the commission on that. For instance, I don't believe Mr. Connole (Former FPC Commissioner William Connole) agrees.

Of course cost isn't the sole criteria, even under the act as written now. But it is an element that should be considered. Perhaps it may work both ways: It may reduce the price of gas in one situation and may actually increase the price in another situation.

But the Supreme Court, as you know, has been very, very critical of the FPC for not considering that element in determining rates.

1. How changes may be brought about.

Q. Mr. Landis, will exemption of small producers be specifically included in the recommendations you are about to make to the President?

A. It might be. I want to test the thing a little bit more. I have talked with quite a few industry people with regard to that and generally they support it.

No one likes to see really hundreds of millions of dollars tied up because of the inability of a regulatory commission to carry out the terms of the statute. It just isn't good for our economy.

Q. Are you considering alternate proposals or do you feel that the exemption approach is the only apparently feasible one?

A. It is the only one I can put my finger on at the moment and say that this has a chance at success

Q. Will it be necessary to get congressional action to authorize such an exemption or can the commission do this?

A. There is a difference of opinion on that. The FPC, although it hasn't taken a position officially, more or less officially feels that it would perhaps be too dangerous to try and do that through purely administrative action.

However the commission already makes some distinction between large and small producers. For instance, there is quite a difference in some of the report forms they file. In fact, the commission virtually exempts small producers from filing any economic reports.

Now if the FPC has the power to do that, it may be that it could extend that concept to the power to exempt the small producers from rate procedures.

2. Schedule for plan of action.

Q. When do you expect to submit your proposals to the President?

A. Early in April.

Q. Will these be your complete recommendations or a starting point?

A. A starting point, but an important starting point I feel. It will be followed with more specific proposals later.

Q. Will this matter of doing something about the regulatory agencies carry a high priority with the administration?

A. I think it is carrying a high priority now and I hope it will until a real dent is made on the situation that exists today. I think there will be an aggressive effort by the administration, including pressing for any needed legislation.

Q. What has been the reaction to your basic proposals with members of Congress and industry?

A. The reaction I have gotten so far has been quite good. None of the congressional leaders I have talked to feel that this effort impinges on the rights of Congress.

They may not agree with the proposals, but the basis of their disagreement is not that the Executive Department is doing something outside the scope of its powers

I've talked with industry people, too. I find that the industry itself would like to see stability come into this situation. I don't think they like it as it is now.

Q. If your proposals include proposed amendments to the Natural Gas Act, isn't that likely to start an endless debate over changes that should or shouldn't be made?

A. I would hope not because if you confine the amendments to what I would call the procedural aspects of this thing, I think you would find general agreement in Congress that something should be done. And I think you might find agreement as to just what should be done.

Of course, if you start opening the substance of the act, you'd really get bogged down because of the varying viewpoints.

3. A view on area-pricing approach.

Q. Mr. Landis, have you formed an opinion on the area-pricing approach the FPC is now trying to use?

A. Well, I'm beginning to form one.

I had more hopes for the approach being successful when it was originally announced than I have at the moment. I have seen what has been taking place and I'm not at all sure that it is the answer.

As you know, the commission started off on this thing as if it were intended to be a regulation, then it altered its position to say that it was merely a statement of policy. Now it is holding hearings.

Steps the commission has taken have raised, or potentially raised, a legal question.

The public utilities commission of Wisconsin has stepped in already to try and enjoin the operation. And I think there are a couple of private efforts, too, to upset the area approach.

I know of one effort that is very insistent that there be an escape clause to it. If you do this, you open the field to individual actions. And the contention is that if you don't have an escape clause, then you may be violating the provision of the statute.

4. Speeding pipeline permits.

Q. You mentioned earlier, Mr. Landis, some possible way of speeding the handling of pipeline construction permits. Would you explain what you have in mind?

A. There again, a considerable degree of exemption could be had without hurting the public interest at all.

I pointed out in my report that the commission had never used the service area provision of Section 7-f. The commission doesn't like 7-f. What they would like is the power to establish the exemptions themselves.

Of course, you must bear in mind that the major projects require a real finding of public convenience and necessity, but the scope of the legislation with regard to the necessity of hearings makes too big an umbrella, takes in too much.

There is a tremendous jam in the issuance of construction permits. I was looking at some figures just this morning. I think there were pending as of the end of last month construction permit applications for $850 million. Now obviously not all of those will be granted. Some are overlapping and some are protective applications.

But let's assume that 50% would be granted. Well, there in a sense is over $400 million in construction that might be going on.

I had one company tell me that because of the delay, one of their projects cost something like $100 million more than they had estimated about 3 years previously when they started trying to get the permit.

5. Plans for FPC reorganization.

Q. What plans do you have for reorganization of the commission itself?

A. I think that if you added two more men to the commission you could then divide the commission permanently into two panels of three commissioners each, not including the chairman.

One of these panels would handle the electric power side of the commission's activities. The other would handle the Natural Gas Act and the activities under that.

The reason for this division is that men who might be very competent in the electric-power regulatory field might not have that competence in the natural-gas field. And I think it would do regulation quite a bit of good to develop competence among regulatory officials.

Q. What would be the principal role of the chairman under this new set-up?

A. The chairman would have charge of the whole administrative end of the commission. And that is an important function: Controlling dockets, seeing that cases are vigorously pushed and completed, eliminating unnecessary detail in the handling of cases.

Moreover, I could see wisdom in his being an ex-officio member of both panels. Not that he would sit all the time, but there might be a case of such significance that he might like to give it his personal attention.

With the chairman on a panel, you might have a division of vote, 2 to 2. That is unlikely, but if you did, then you could have a hearing before the full commission of 7 so as to be sure of a decision.

6. A regulatory 'overseer'?

Q. In your initial report to Mr. Kennedy, you spoke of the need of an overseer from the executive branch to ride herd on the regulatory agencies. Is that still your plan? If so, do you expect objections from Congress that this is an invasion of their field?

A. Perhaps I had the wrong name when I used the word overseer. It has been interpreted by some that I meant czar. That's not what I had in mind.

The thing I had in mind was that an overseer—I don't like that term any more—should find the trouble spots. He could call them to the attention of an agency or to the attention of the President.

Q. Did you help select Joseph Swidler to be FPC chairman or Howard Morgan to be a member of the FPC?

A. I had nothing to do with regard to Mr. Swidler. When Mr. Morgan's name was mentioned, I made an effort to check him with people that have known him and his work in Oregon. The responses were all very favorable.

Where Domestic Crude Goes Within the U. S.

Exports to other states, in thousands of barrels daily.

ROCKY MOUNTAINS: Shipments rise.

(Figures include Colorado, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming)

	1956	1957	1958	1959	1960
DISTRICT 1					
N. Y. (West)	2.8	8.3	8.4	3.6	8.2
Pa. (West)	....	....	....	3.0	6.4
Total	2.8	8.3	8.4	6.6	14.6
DISTRICT 2					
Ill.	46.1	51.7	61.8	59.4	66.9
Ind.	99.1	121.3	137.4	143.0	173.0
Kans.	25.6	23.9	14.0	15.0	14.7
Ky.	....	....	....	....	0.2
Mich.	47.6	47.6	48.8	52.2	46.2
Minn.-Wis.	8.2	8.9	10.0	15.0	22.9
Mo.	11.2	10.2	7.7	4.7	8.1
Neb.	2.1	2.2	2.5	2.5	2.5
Ohio (East)	3.5	1.3	....	0.7	4.4
Ohio (West)	22.5	24.3	18.8	19.7	21.7
Okla.	....	....	3.7	20.7	22.2
Total	265.9	291.4	*304.8	332.9	382.8
DISTRICT 3					
La.	....	....	2.6	1.2	....
N. Mex.	0.1	0.1	....	....	....
Texas	....	....	7.2	9.7	13.4
Total	0.1	0.1	9.8	10.9	13.4
DISTRICT 4					
Colo.	20.0	23.2	24.5	30.2	30.7
Mont.	40.0	39.8	42.0	46.7	42.3
Utah	78.5	76.2	69.5	69.8	69.2
Wyo.	4.6	6.2	7.1	6.6	6.3
Total	143.1	145.4	143.1	153.3	148.5
DISTRICT 5					
Calif.	....	0.4	18.4	33.4	24.9
Ore.-Wash.	....	....	5.6	1.9	6.7
Total	....	0.4	24.0	35.3	31.6
TOTAL U. S.	411.9	445.6	490.1	539.0	590.9
Intrastate	160.0	163.2	158.1	175.6	179.0

TEXAS: Out-of-state movement drops.

	1956	1957	1958	1959	19
DISTRICT 1					
Del.-Mass. R. I.	7.0	45.2	49.1	43.5	2
Fla.-Ga.-S. C.-Va.		1.3	2.2	0.4	
N. J.-Md.	122.8	109.8	100.3	106.9	8
N. Y. (East)	2.0	....	....	....	
N. Y. (West)	25.3	25.2	24.6	23.5	1
Pa. (East)	190.1	202.6	175.0	179.0	15
Pa. (West)	4.2	6.0	8.3	4.7	
Total	351.4	390.1	359.5	358.0	29
DISTRICT 2					
Ill.	237.5	242.4	254.4	270.5	26
Ind.	137.0	95.1	97.7	93.1	6
Kans.	37.8	18.7	7.6	7.8	
Ky.-Tenn.	3.9	2.0	....	4.3	
Mich.	32.6	31.8	26.4	32.1	3
Mo.	42.3	36.9	25.4	20.3	1
Ohio (East)	4.3	3.8	0.8	2.6	
Ohio (West)	156.3	136.1	133.5	127.6	10
Okla.	39.7	41.5	47.2	61.2	5
Total	691.4	608.3	593.0	619.5	54
DISTRICT 3					
Ala.-Miss.	....	....	....	....	
Ark.	6.9	3.1	0.3	....	
La.	134.7	108.5	98.0	83.2	8
N. Mex.	3.8	4.2	1.7	....	
Total	145.4	115.8	100.0	83.2	8
DISTRICT 4	....	....	....	....	
DISTRICT 5	....	....	....	....	
TOTAL U. S.	1,188.2	1,114.2	1,052.5	1,060.7	92
Intrastate	1,856.6	1,781.3	1,571.4	1,658.0	1,68

*EDITOR'S NOTE: In a few cases, interstate shipments of less t 1,000 bbl. daily are not listed in tables. However, these shipments included in the U. S. and district totals.

SOURCE: Bureau of Mi

Texans Lose Crude Markets in Their State and

CRUDE producers in other states are benefiting from market trends set in motion by tighter proration in Texas last year.

Statistics in the latest report of the Bureau of Mines clearly reveal these developments:

...The Texas market itself attracted more out-of-state crude. Movements into Texas came from Louisiana, Mississippi, Oklahoma, New Mexico, and the Rockies. Kansas was the only important producing state in the region that did not make crude shipments to Texas.

...Shipments from Texas to other areas declined, leaving this market open to more crude from other producing states. Texas, in fact, shipped less crude into the Mid-Continent and East Coast districts than in any year since 1955.

The Texas story . . . Producers in the Lone Star State shipped about 80% more crude to their local refineries than to plants outside the state.

Texas refiners actually received 1,681,200 bbl. daily of the state's production during 1960, a rate that is about in line with volume over the past few years. The percentage, however, is higher than normal because of the cut in Texas production during the year.

The 1960 Texas production was about 38 million barrels under the total for 1959. Since many of the major purchasers of Texas crude also have refineries within the state, normal crude demand at these plants

LOUISIANA: Shipments to Texas up again.

	1956	1957	1958	1959	1960
DISTRICT 1					
Del.-Mass.-R. I.	27.0	17.7	16.7	30.7	32.9
N. J.-Md.	43.4	55.9	27.3	35.3	62.5
Pa. (East)	45.1	64.8	49.7	45.6	47.8
Total	115.5	138.4	93.7	111.6	143.2
DISTRICT 2					
Ill.	1.0	0.8	0.5	....	2.1
Ky.-Tenn.	10.8	2.4	0.7	7.8	25.1
Ohio (East)	....	....	....	....	1.9
Ohio (West)	2.0	9.7	20.4	44.2	45.4
Total	13.8	12.9	21.6	52.0	74.5
DISTRICT 3					
Ala.-Miss.	....	0.3	0.6	0.9	0.9
Ark.	1.9	3.7	5.3	2.4	3.4
Tex.	172.7	195.2	232.9	270.9	340.2
Total	174.6	199.2	238.8	274.2	344.5
TOTAL U. S.	**303.9**	**350.5**	**354.1**	**437.8**	**562.2**
Intrastate	470.7	445.1	435.5	506.1	464.0

NEW MEXICO: More for District 2.

DISTRICT 1	....	....	....	0.4	0.4
DISTRICT 2					
Ill.	29.2	21.4	21.2	12.9	32.2
Ind.	1.5	13.5	1.8	13.2	21.1
Kans.	....	8.2	12.8	13.7	15.4
Mo.	....	15.1	29.9	28.2	32.4
Ohio (West)	8.0	11.4	8.5	4.1	3.8
Okla.	2.8	0.6	3.2	2.0	4.6
Total	41.5	70.2	77.4	74.1	109.5
DISTRICT 3					
Texas	159.6	154.7	150.2	155.7	129.7
Total	159.6	154.7	150.2	155.7	129.7
DISTRICT 4	....	....	....	0.7	0.9
DISTRICT 5					
Calif.	....	1.1	10.5	20.2	20.2
Ore.-Wash.	....	....	3.4	9.7	10.6
Total	....	1.1	13.9	29.9	30.8
TOTAL U. S.	**201.1**	**226.0**	**241.5**	**260.8**	**271.3**
Intrastate	20.3	22.0	22.7	24.2	23.0

OKLAHOMA: Movement to District 2 off.

	1956	1957	1958	1959	1960
DISTRICT 1					
N. Y. (West)	6.8	10.4	7.2	10.7	8.2
Pa. (West)	....	....	....	1.1	1.4
W. Va.	....	....	....	....	....
Total	6.8	11.5	7.2	11.8	9.6
DISTRICT 2					
Ill.	75.6	67.6	67.0	80.5	77.8
Ind.	72.9	81.5	74.5	92.2	74.1
Kans.	30.0	26.2	25.7	26.8	27.1
Mich.	7.1	5.8	5.5	2.6	....
Mo.	8.0	4.7	9.9	1.9	3.0
Ohio (East)	12.0	4.5	9.2	5.9	4.5
Ohio (West)	45.9	50.4	33.1	27.8	26.3
Total	251.5	240.7	224.9	237.7	212.8
DISTRICT 3					
La.	....	....	....	0.1	0.1
Texas	4.8	3.4	10.4	9.5	21.9
Total	4.8	3.4	10.4	9.6	22.0
Total U. S.	**263.1**	**255.6**	**242.5**	**259.1**	**244.4**
Intrastate	267.8	270.3	259.7	256.8	254.3

KANSAS: Still moving less interstate.

DISTRICT 1					
N. Y. (West)	6.0	3.5	0.4	0.9	6.1
Total	6.0	3.5	0.4	0.9	6.1
DISTRICT 2					
Ill.	42.1	35.8	34.5	31.5	26.0
Ind.	64.6	73.2	73.9	64.9	58.7
Mich.	....	0.1	1.1	2.5	0.3
Mo.	6.4	2.0	1.1	0.1	0.3
Ohio (East)	4.5	3.8	1.3	0.9	....
Ohio (West)	....	....	....	....	0.2
Okla.	34.4	34.4	31.6	28.6	24.7
Total	152.0	149.3	143.5	128.5	110.2
DISTRICT 3	3.0	1.1	....	....	....
DISTRICT 4	....	....	....	....	....
DISTRICT 5	....	....	....	....	....
TOTAL U. S.	**161.0**	**153.9**	**143.9**	**129.4**	**116.3**
Intrastate	179.6	207.7	227.8	236.1	236.9

nd in Other Areas

naturally accounted for a larger percentage of the reduced production.

Refiners outside Texas received less Texas crude, meanwhile. This volume was nearly 339 million barrels or an average of 925,900 bbl. daily for the year. It compares with an average of 1,060,700 bbl. daily for 1959.

The Mid-Continent and East Coast regions received the bulk of Texas out-of-state shipments with Illinois taking more Texas crude than any other state. The average for Illinois was 363,100 bbl. daily or 28.4% of all crude moved out of Texas. Other states in the Mid-Continent receiving Texas crude were Indiana, Michigan, Missouri, Ohio, and Oklahoma.

Refiners along the East Coast took 31% of the crude shipped out of Texas. The movement averaged 291,300 bbl. daily, the lowest rate for the last 6 years. Refiners in New Jersey, Pennsylvania, and Maryland accounted for the bulk of this crude.

Louisiana gains . . . The only increase in movements out of Texas was the 4,300-bbl.-daily increase in the flow to Louisiana, but this was small compared with the big jump in shipments from Louisiana into Texas.

The Louisiana-to-Texas shipments have increased every year since 1955. They averaged 155,700 bbl. daily in that year and for 1960 topped 300.000 bbl. daily. Louisiana shipped more crude into Texas last year than Kansas produced, and for the last 3 years more than half of the interstate movement of Louisiana crude has gone to Texas.

One development was noteworthy in Louisiana in 1960: For the first

Where Foreign Crude Is Delivered in the U. S.

(Thousands of barrels daily)

	1956	1957	1958	1959	1960
DISTRICT 1					
Del.-Mass.-R. I.	28.8	85.1	60.6	65.2	68.7
Fla.-Ga.-S. C.-Va.	16.5	33.6	32.3	39.6	42.5
N. J.-Md.	243.3	220.0	221.5	229.1	264.8
N. Y. (East)	34.7	35.6	27.0	25.4	21.9
Pa. (East)	344.6	283.3	301.2	280.0	268.8
Total	667.9	657.6	642.6	639.3	666.7
DISTRICT 2					
Ky.-Tenn.			7.2	2.2	
Mich.	4.8	4.2	3.7	5.2	6.9
Minn.-Wis.	44.6	52.0	55.1	50.7	53.5
Ohio (West)	5.0	4.9	3.4	0.7	4.7
Total	54.4	61.1	69.4	58.8	65.1
DISTRICT 3					
Ala.-Miss.	3.3	2.7	1.4	0.4	0.4
La.		1.9	3.2	2.8	1.2
Texas	29.3	19.3	39.9	23.6	2.8
Total	32.6	23.9	44.5	26.8	4.4
DISTRICT 4	0.2	0.2			
DISTRICT 5					
Calif.	123.8	182.4	128.4	152.1	176.1
Ore.-Wash.	55.1	77.2	56.9	82.4	100.3
Total	178.9	259.6	185.3	234.5	276.4
TOTAL U. S.	934.0	1,002.4	941.8	959.4	1,012.6

time in recent years, Louisiana producers shipped more crude out of the state than they did to refiners within the state.

Western growth . . . The Rocky Mountain producing area is becoming another important source of crude for refiners, particularly in the North Central states.

Producers in the Rockies ship crude out of the area at the rate of 442,400 bbl. daily. They also shipped 148,500 bbl. daily to other states within the district and 179,000 bbl. daily to refineries within the states where the crude was produced.

The intrastate shipments thus accounted for only 23% of crude movements last year; but total shipments to refiners throughout the Rocky Mountain area represented 42.5% of total crude moved by producers in the area.

District 2 remained the major market for Rocky Mountain crude, taking 50% of the region's shipments. And 63% of this volume going into District 2 was taken by refiners in Illinois and Indiana.

Two unusual crude movements from the Rocky Mountain region are worth noting:

. . . Texas has been taking a small volume of Rocky Mountain crude for the past 3 years. These shipments, however, averaged 13,400 bbl. daily last year.

. . . Eastern refiners—in western Pennsylvania and New York particularly—took a total of 14,600 bbl. daily from the Rockies last year.

Other trends . . . Oklahoma's crude shipments are on the downgrade.

The state normally uses about half of the crude it produces and ships the other half out of the state, usually to other states in District 2. Shipments to states in the district accounted for about 43% of total crude shipments by Oklahoma producers last year. The total of 212,800 bbl. daily shipped into the district for 1960 was the lowest volume in the last 6 years.

Oklahoma swaps crude with Kansas and Texas. Oklahoma moved about 27,100 bbl. daily into Kansas last year and received 24,700 bbl. daily from Kansas. Oklahomans sent 21,900 bbl. daily into Texas but in turn received 51,900 bbl. daily from Texas.

Kansas producers, for some reason, last year sent no crude of record into Texas—one of the few oil states not to do so. Kansas producers have shipped crude to Texas in past years.

Only about one-third of Kansas' production moves out of the state. Shipments to refineries in the state last year amounted to 236,900 bbl. daily compared with 116,300 bbl. daily to outside refiners. All but about 6,000 bbl. daily of these outside shipments went to other states in District 2.

New Mexico producers also are finding a growing outlet for their crude within District 2. Shipments to District 2 from New Mexico averaged 109,500 bbl.

This is the highest in recent years and probably an all-time record. Shipments to Texas averaged 129,700 bbl. daily, the lowest rate in the last 7 years. New Mexican refiners took less than 8% of the state's crude, amounting to 23,000 bbl. daily.

Oil from abroad . . . Bulk of the foreign crude coming into this country winds up on the East Coast.

The table shows that about two-thirds of all foreign crude was processed on the East Coast. Movement of Canadian crude into District 2 accounted for 5,100 bbl. daily reported for that district.

Some foreign crude went to Texas, but the total was down to 2,800 bbl. daily compared with 23,600 bbl. daily in 1959.

Topping plant will be built on Alaska's Kenai Peninsula

A TOPPING plant with a capacity of 2,000 to 2,500 bbl. daily will be built in the Anchorage area of Alaska by a new company.

Western Frontier Oil & Refining Co. has been set up to build the plant.

Ralph G. Hand, vice president of Refiners Sales Co., Long Beach, Calif., heads the new company.

The plant will charge Kenai Peninsula crude and will produce gasoline, kerosine, jet fuel, diesel oil, and bunker "C" fuel oil.

Hand says he hopes to have the plant in operation by September. Construction will start as soon as the plans are approved by various agencies in Alaska.

Hand and his father, Ralph T. Hand, have operated the Long Beach plant for about 20 years.

Thermal-Diffusion Process Gives Better Lubes

THOUGH more expensive than conventional multigrade motor oils, lubes produced by a thermal-diffusion separation process perform so well that the added cost may be justified.

This, in effect, is the conclusion of some Standard Oil Co. (Ohio) researchers. They conducted road tests with a 5W-20 lube largely composed of thermal-diffusion oils.

The researchers said that because of the lower viscosity and higher viscosity index imparted to overhead products by the thermal diffusion (TD) process, such lubes can give about 50% longer service life than the commercial oils tested.

Why the improvement . . . The TD process separates oil molecules according to their shapes, H. E. Alford of Sohio told the American Chemical Society at a St. Louis meeting last week.

Molecules with superior lubricating abilities are concentrated in the overhead product.

Sohio researchers found that at constant viscosity, the TD overhead products have viscosity indexes 13.7 to 34 numbers higher than conventionally refined oils.

On the other hand, the bottom products are lower by 3.5 to 56.4 numbers in viscosity index than the neutral oils. This is explained by the fact that the overhead products are more paraffinic and the bottoms are more aromatic than the feed stock.

Other improvements in lubricating qualities resulting from the TD process include these:

. . . **Greater resistance** to oxidation and carbonization.

. . . **Volatility** of the overhead fraction is lower. This characteristic should make TD oils an excellent component in the preparation of vacuum-pump oils.

Results of Fleet test . . . To evaluate the suitability of TD lubes, a 5W-20 oil and a series of 10W-30 oils were compounded. Makeup of the former was 76% overhead product, 10% heavy neutral oil, and 4% viscosity-index improver.

A 4-months test was made in 52 cars driven by Sohio salesmen.

At the end of the test a statistical analysis confirmed pre-test predictions.

The 5W-20 oil showed a striking decrease of 35% in oil consumption (50% increase in service life) compared with the commercial oils. The new oil performed satisfactorily in all properties.

A TD 10W-30 oil gave consumption comparable to that of the commercial 10W-30 oils. This was expected, Alford said, since viscosity and not volatility controls consumption with heavier oils.

Process highlights . . . Thermal-diffusion oils used in the fleet tests were prepared in the laboratory, using a set of 6-ft. concentric tubes.

The tubes were operated with a 445°-F. hot wall and a 130°-F. cold wall. Slots, 0.03 in. wide, permitted transverse flow. In most cases a 50% overhead-50% bottoms split was made.

A large-scale production unit has been designed, Alford said. It consists of a series of 34-ft. exchanger units, each having 96 concentric-tube sets. Silt width is set at 0.045 in.

Operating conditions, using a feed of solvent-extracted neutral oil, would include a 600°-F. hot-wall temperature and 150° F. on the cold wall.

Capital cost for such a 10-unit exchanger was estimated at $110,000 for a production rate of 3,300 gal. per day, or $1,395 per daily barrel of product.

Biggest operating expense would be for heating. A heat consumption of 400,000 Btu. per gallon of top product can be expected, Alford said.

Co-authors of the paper on the process were G. R. Brown and S. M. Darling of Sohio's research department, Cleveland, Ohio.

Los Angeles Tightens Fuel-Oil Ban

THE WEST COAST fuel-oil market has received another jolt.

Los Angeles County officials have extended the county's fuel-oil ban a month, prohibiting the burning of fuel oil with a sulfur content of more than 0.5% from April 15 to November 15. The present ban extends from May 1 to October 31.

The county's action may mean some new processing units will be added to the area's refineries in order to upgrade the fuel oil to other products. Refiners have declared they will either add the units or seek markets outside the county.

The vote to extend the ban came at a hearing where Western Oil and Gas Association was seeking relief from the current ban. The association hoped to get Rule 62, the fuel-oil ban regulation, amended to permit fuel-oil burning on days when smog is not forecast.

The county's board of supervisors voted to extend the ban after representatives of the county medical association declared they are forced to order patients out of the Los Angeles area due to smog. The doctors did not pinpoint fuel-oil burning as the specific cause of the ill effects of smog.

The association's argument was that fuel-oil burning does not contribute anything harmful to the atmosphere (OGJ, March 13, p. 99) and that studies show the sulfur dioxide content of the air is well within the state's pure-air standards.

U. S. to Ease Credit

THE FEDERAL Government was in the process late last week of clearing a major hurdle from the path of U. S. manufacturers who sell oil-field equipment abroad.

The long-standing policy of the Export-Import Bank which bars credit terms on sales of oil-field equipment, supplies and services to any nation that has an oil monopoly was being revised.

The policy virtually foreclosed a large potential market for U. S. firms. The change could mean $150 to $200 million more business annually for American companies.

Long-term credit would now be possible on equipment sales and service.

Here's Why Tennessee Gas Wants Its

A COMPANY which is in the process of paying $325 million for "in-place" gas reserves for its gas-transmission system has described how—and why—this revolutionary trend in the industry developed.

Tennessee Gas Transmission Co. is acquiring ownership of more than 2 trillion cubic feet of gas reserves in three separate Louisiana deals. This differs fundamentally from the usual method of obtaining gas reserves by long-term purchase contracts.

President Harold Burrow of TGT gives four reasons to explain why his company is buying reserves in place.

. . . The only way some reserves can be acquired from producers is by outright purchase. This is because the producers, under the Catco-TGT decision, do not want to submit to Federal Power Commission regulation on initial prices in gas-purchase contracts.

. . . Pipeline-company ownership of reserves boosts flexibility in gas dispatching. The company can reduce or increase the amount of gas taken from its own reserves as needed, while under gas-purchase contracts it must take or pay for minimum amounts daily.

. . . The effect of inflation can be forestalled by pipeline - company purchasing of reserves at today's prices.

. . . It's an advantage to know the cost of gas in advance, whether there's inflation or deflation.

Burrow says he can speak only in general terms about why the producer figures the sale of reserves is a worthwhile deal, but cites three basic reasons:

. . . The producer gets a substantial down payment in cash (TGT has paid $35,700,000 in cash—more than 10% of the total—in its three deals).

. . . He is freed of the obligation and responsibility for operating the field.

. . . He escapes federal regulation in disposing of the gas.

Producer problems . . . Negotiating the purchase of reserves from a producer is no cinch.

"Frankly, I know of nothing harder than to get a company to get rid of its reserves," Burrow says.

Harold Burrow
. . . wants even more TGT reserves.

When producers sell for a fixed price, they ask themselves whether they could dispose of the reserves later at higher prices—particularly in an inflationary period — and whether they are losing too much simply to escape regulation.

"Evidently they think not," Burrow observes. "And we hope they will take their money, go find some more gas, and come knocking on the door again."

Purchaser problems . . . If the producer has qualms about selling, the purchaser also has reason to cross his fingers.

The pipeline company must become a producing company. If it has no production organization it must create one. It must take on the job of extracting the gas liquids and marketing them. If there is oil in the field, it must produce and sell it.

"One thing is certain," Burrow says. "If you were not in the producing business before the trade, you certainly are after it."

Another factor is the ability of the pipeline company to produce the gas as fast as it is paid for.

If, for example, payments run over 17 or 18 years and the field has a 25-year life, the company may be paying out money faster than it is producing gas for revenue.

And you are out the interest on your money until such time as the gas is produced, Burrow comments.

Regulation . . . Both producer and purchaser face regulatory problems and uncertainties—and Burrow admits frankly he's no oracle on what the Government will do in regard to the new method for acquiring gas reserves.

Since TGT is buying reserves, the FPC could not set the price per 1,000 cu. ft. of gas in the traditional sense.

The regulatory aspects, however, vary from case to case. Each of TGT's three deals for Louisiana reserves is being handled differently.

Here is the status of the deals:

. . . MCN (Mobil - Continental - Newmont). Last August a TGT subsidiary agreed to purchase MCN leasehold rights in the north half of Block 46, Vermilion area, and the eastern part of Block 64, East Cameron area.

The deal includes 470 billion cubic feet of gas and more than 6.6 million barrels of liquid hydrocarbons.

TGT will pay $8.3 million in cash and about $60 million in non-interest-bearing notes over 16 years.

The FPC must approve a certificate for a $2,302,000 pipeline to connect the reserves to the TGT system before the agreement is final. A hearing on the certificate application is set for this week.

. . . Bastian Bay. In December TGT paid Pan American Petroleum Co. $9.4 million in cash and executed $150 million in noninterest-bearing notes payable over 17 years.

Pan American's reserves in Bastian Bay were in excess of 1 trillion cubic feet. This gas, now owned by TGT, is moving into the new owners lines.

In the purchase, the company used a "budget"-type certificate it already possessed as its authority to construct 2.5 miles of field connections to a TGT line which bisects the field. The certificate authorizes $5 million in construction with a limit of $500,000 for any single project.

"In my opinion, no other certificate is required in connection with this purchase," Burrow said.

. . . Ship Shoal. TGT has agreed

rs Own Reserves

to pay the Catco group (Continental, Atlantic, Tidewater, Cities Service) $18 million in cash and $79.3 million over 16 years for about 533 billion cubic feet of gas and 16 million barrels of liquid hydrocarbons in Blocks 198 and 199, Ship Shoal area.

Catco attorneys are consulting with the Internal Revenue Service on taking capital gains on profits from the sale. The sale is contingent on Catco's receiving a satisfactory ruling.

In the agreement to purchase these reserves, there is no restriction as to obtaining a certificate. After acquiring the leases, TGT would seek authority to build connecting lines.

Burrow hasn't disclosed any new plans TGT may have for getting more in-place reserves. But it's no secret the company is looking.

Pointing out that the company would still own less than 10% of its reserves under the three Louisiana deals, Burrow says: "It would be fine if it were 100%."

Louisiana okays first unitizations under revised law

LOUISIANA'S conservation department last week approved the first two unitization projects under a 1960 measure which broadens the unitization law.

One of the projects authorizes a pressure-maintenance program by water injection in the Broussard oil sand in Erath field, Vermilion Parish, with Tidewater Oil Co. as operator.

The other covers primary recovery in the Vicksburg sand of Kinder field, Allen Parish, with Sun Oil Co. as operator. The Kinder field unitization order also covers pressure maintenance if this is necessary later.

The 1960 law—Act 441—provides that the conservation commissioner can force-pool an entire oil or gas reservoir rather than a single unit as in the past (OGJ, July 18, p. 74).

However, 75% of the owners in interest must agree to the program.

watching WASHINGTON

Clyde La Motte

• Wanted: An oil man for Office of Oil and Gas . . .

INTERIOR wants the oil industry to suggest a top-flight oil man to be director of the Office of Oil and Gas.

This ties in with Interior's over-all effort to make the department the key oil agency in the Government.

It is also in keeping with the new administration's efforts to put oil men in oil-related posts at Interior. Note that John Kelly was picked for the important assignment as assistant secretary for minerals. And Interior Secretary Stewart L. Udall also has chosen Howard Marshall and J. R. Parten as advisers. All three, of course, are from the oil industry.

With L. J. O'Connor—another man with an oil background—remaining as oil import administrator, the selection of an oil man to head the Office of Oil and Gas would round out the oil "team" at Interior.

This is in contrast with past years when, except for wartime emergencies, Interior's oil-related jobs were headed by non-oil people—usually by government career men.

Udall's theory is that the best source for information about an industry is an expert from that industry. For instance, he met recently with top coal-industry people and, as a result, last week announced the appointment of a vice president of a major coal company to head Interior's Office of Coal Research.

The oil industry hasn't yet suggested anyone for the Office of Oil and Gas. This may result in the appointment being made on a political basis rather than an oil-knowledge basis.

• Interior prepares for new look at crude rules . . .

PLANS are beginning to shape up for Interior's fresh look at crude-oil import regulations.

A public hearing is likely, probably sometime in May. This will give Udall an opportunity to hear all sides.

Chances are, Interior will propose some changes in current regulations before the public hearing—thus giving industry segments specific points to comment on.

The Oil Import Administration staff has been tentatively mapping some changes. For the most part, these are aimed at making restrictions a little tighter, and to help solve some related problems such as the increase in natural-gas liquids and the increase in imports from Canada and Mexico.

• Landis recommendations may start things popping . . .

WATCH for the upcoming report by James M. Landis to President Kennedy on regulatory agencies and how to improve them.

The recommendations by Landis, due out the first week in April, will cover many areas of interest to the oil industry in addition to his proposals aimed at natural-gas regulation (p. 55).

For instance, he will have recommendations affecting the Federal Trade Commission. And it is entirely likely he will elaborate on his theory that the Government must play a bigger role in over-all energy planning. If so, it is expected he will urge that Interior "upgrade" and enlarge its staff work so as to become the focal point for energy projects.

This may set the stage for the administration to make its own fuels policy study—particularly if the plan for such a study by Congress gets bogged down between the Senate and the House.

U. S. Crude-Oil Reserves: Thousands of barrels

	Proved reserves 1-1-60	Extensions and revisions	New discoveries*	Production in 1960	Proved reserves 1-1-61	Changes in 1960
Alabama	34,248	6,387	.....	7,330	33,305	− 943
Arkansas	312,911	14,416	820	26,150	301,997	− 10,914
California†	3,762,507	189,168	10,916	304,049	3,658,542	− 103,965
Colorado	380,952	28,128	1,510	46,731	363,859	− 17,093
Illinois	594,407	37,694	1,473	77,648	555,926	− 38,481
Indiana	73,751	3,338	947	11,985	66,251	− 7,700
Kansas	917,503	68,198	11,165	113,017	883,849	− 33,654
Kentucky	136,324	14,146	122	21,685	128,907	− 7,417
Louisiana†	4,660,088	417,301	54,275	346,284	4,785,380	125,292
Michigan	55,335	37,752	625	15,890	77,822	22,487
Mississippi	389,337	64,643	3,238	50,120	407,098	17,761
Montana	309,268	− 16,890	4,590	30,281	266,687	− 42,581
Nebraska	80,558	20,828	8,335	23,547	86,174	5,616
New Mexico	1,025,789	142,951	19,187	104,269	1,083,658	57,869
New York	34,197	.....	.....	1,814	32,383	− 1,814
North Dakota	381,909	63,962	6,580	21,930	430,521	48,612
Ohio	74,137	5,590	.....	5,050	74,677	540
Oklahoma	1,864,749	106,157	9,248	189,654	1,790,500	− 74,249
Pennsylvania	113,574	.....	.....	5,942	107,632	− 5,942
Texas†	14,859,674	703,918	90,959	896,059	14,758,492	− 101,182
Utah	194,539	50,068	1,332	37,475	208,464	13,925
West Virginia	51,259	2,449	.....	2,275	51,433	174
Wyoming	1,402,938	146,690	8,519	130,772	1,427,375	24,437
Miscellaneous‡	9,193	4,578	20,015	1,507	32,279	23,086
Total United States	**31,719,347**	**2,111,472**	**253,856**	**2,471,464**	**31,613,211**	**− 106,136**

*Only a limited area is assigned to each new discovery. †Includes off-shore reserves. ‡Includes Alaska, Arizona, Florida, Missouri, Nevada, South Dakota, Tennessee, Virginia, and Washington.

U. S. Reserves: Crude Down, Gas Up

• Weak showing by oil finders caused net drop in crude reserves in 1960, but the loss is offset by a record high in reserves of all liquid hydrocarbons. Natural-gas reserves also climbed to an all-time mark last year.

THE POOREST performance in 15 years was turned in by U. S. oil finders last year, resulting in a net decline in crude reserves at the end of 1960.

Still, the gain in natural-gas liquids more than offset the crude deficit and boosted reserves of total liquid hydrocarbons to a new high.

Natural-gas reserves rose to a new peak, but explorers here could claim no outstanding year either.

Canada made substantial gains in reserves of liquid hydrocarbons and natural gas.

These estimates, including proved reserves only, were made by the American Petroleum Institute for U. S. crude oil, by the American Gas Association for U. S. natural gas, and by both for natural-gas liquids. The Canadian Petroleum Association made all Canadian estimates.

Here is a summary of the reserves picture as of the end of 1960:

... **Crude oil** — 31,613,211,000 bbl., a decrease of 106,136,000 bbl. from the previous year's end.

... **Natural-gas liquids** — 6,816,059,000 bbl., an increase of 293,751,000 bbl.

... **Total liquid hydrocarbons**— 38,429,270,000 bbl., an increase of 187,615,000 bbl., with production at 2,902,843,000 bbl. being second only to the 1957 record.

... **Natural gas** — 263.7 trillion cubic feet, an increase of 1.1 trillion.

In Canada, crude-oil reserves increased 181,418,000 bbl. to 3,678,542,000 bbl. Natural-gas liquids increased 36,376,000 bbl. to 538,521,000 bbl., boosting total liquid hydrocarbons to 4,217,063,000, an increase of 217,794,000 bbl. Natural-gas reserves increased 4.07 trillion to 30.7 trillion cubic feet.

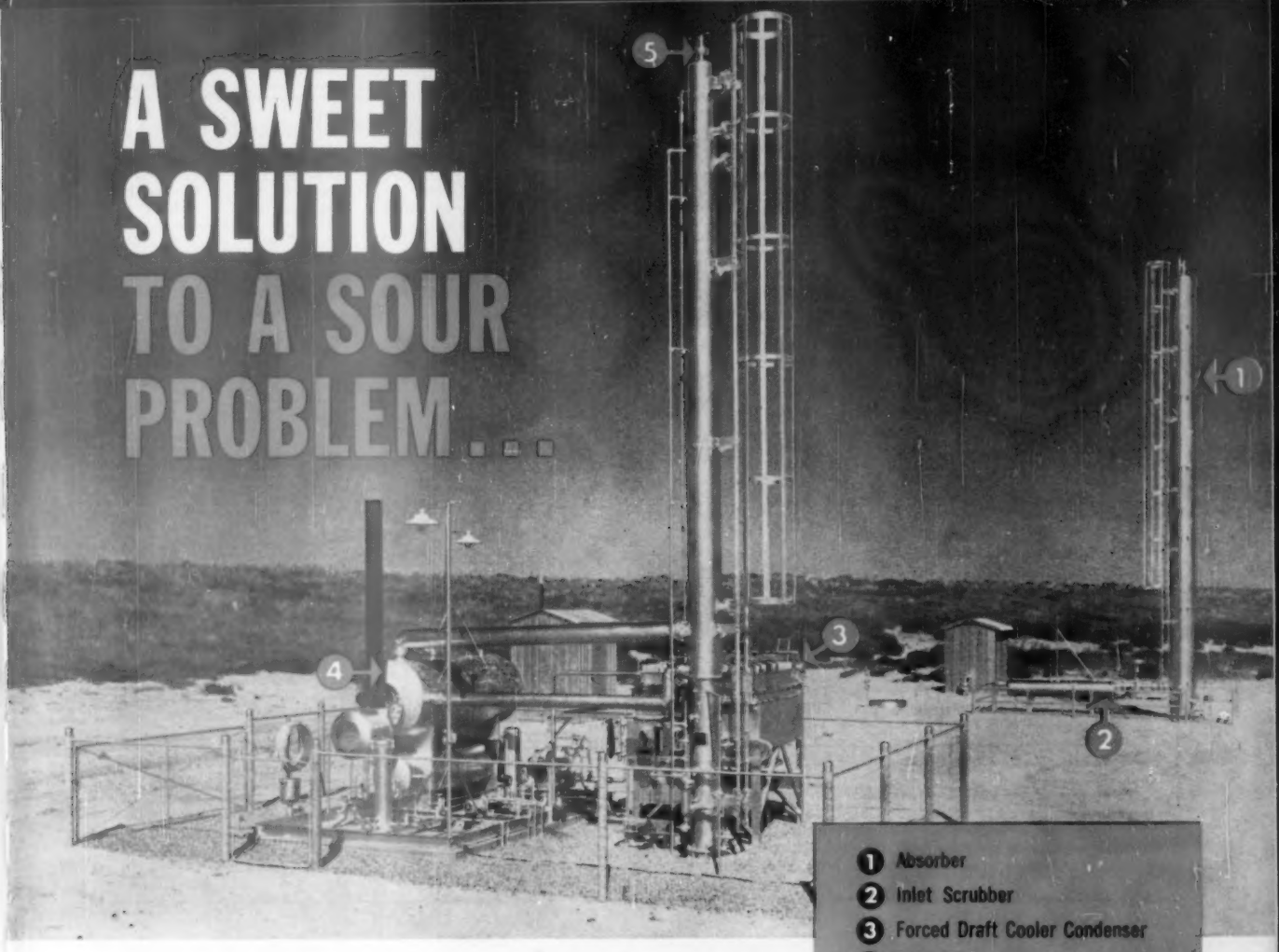
Crude oil . . . The crude-oil reserves decline was the second in 4 years, and the previous decline in 1957 was the first since 1943.

Year-end reserves were down, although crude production also slipped slightly—from 2.48 billion to 2.47 billion barrels.

Only 2,365,328,000 bbl. of gross reserves were added during 1960, the smallest amount since 1945. This compares with 3,666,745,000 bbl. for 1959.

As usual the major additions were the result of revisions of previous estimates and extensions to

A SWEET SOLUTION TO A SOUR PROBLEM...



This unit which processes 4 MMSCFD at 180 Psig. is located in the Hugoton Gas Field, and operates on a completely unattended basis.

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Among gas processing people, BS&B is known for *conservative* design. What does this mean to you? . . . It means that day after day, year after year you get excellent service from your process equipment. It means the quality is built in . . . not brushed on.

Here's why BS&B has sold more desulfurizers than any other manufacturer in the industry:

- *All vessels and welded connections fully stress relieved.*
- *Lowest practical regeneration temperatures.*
- *Control of suspended solids by filtration.*
- *Oxygen block-out from atmosphere.*
- *Low solution velocities in heat exchanger.*
- *All Amine solution returned through a reclaimer, if desirable.*

Ask your local representative or write to Black, Sivalls & Bryson, Inc., Dept. 1-A3A P.O. Box 1714, Oklahoma City, Oklahoma.

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U. S. Natural-Gas Reserves: Millions of cubic feet

	Proved reserves 1-1-60*	Extensions and revisions*	New discoveries	Change in underground storage†	Net production‡	Proved reserves 1-1-61	Changes in 1960
Alaska	57,975	36,993	13,000	0	305	107,663	49,688
Arkansas	1,442,817	83,115	36,360	211	82,793	1,459,710	36,893
California¶	8,593,447	395,351	324,694	30,875	500,472	8,843,895	250,448
Colorado	2,496,159	− 474,828	121,520	565	100,662	2,042,754	− 453,405
Illinois	175,110	8,900	297	7,461	18,633	173,135	− 1,975
Indiana	35,088	1,001	284	1,692	3,945	34,120	− 968
Kansas	19,981,403	128,848	156,452	8,366	666,345	19,608,724	− 372,679
Kentucky	1,159,381	46,048	9,020	1,918	72,518	1,143,849	− 15,532
Louisiana¶	59,853,920	4,333,983	2,254,600	0	3,056,362	63,386,141	3,532,221
Michigan	515,403	7,549	31,200	56,057	24,451	585,758	70,355
Mississippi	2,486,524	31,804	210,390	− 581	186,307	2,541,830	55,306
Montana	665,491	− 17,245	0	14,126	36,194	626,178	− 39,313
Nebraska	132,719	− 3,057	861	0	12,695	117,828	− 14,891
New Mexico	17,912,798	− 1,654,454	127,457	− 3,317	778,760	15,603,724	− 2,309,074
New York	106,519	− 7,588	420	1,662	4,812	96,201	− 10,318
North Dakota	1,206,542	− 35,415	0	0	20,106	1,151,021	− 55,521
Ohio	748,766	34,297	9,250	12,549	39,309	765,553	16,787
Oklahoma	16,651,292	975,342	665,460	1,084	993,975	17,299,203	647,911
Pennsylvania	1,051,972	191,836	18,000	27,448	119,671	1,169,585	117,613
Texas¶	120,475,783	2,471,209	2,428,403	7,309	5,902,789	119,479,915	− 995,868
Utah	1,264,250	260,445	63,734	0	62,289	1,526,140	261,890
Virginia	38,632	− 3,300	300	0	2,342	33,290	− 5,342
West Virginia	1,593,551	318,967	71,488	37,001	189,882	1,831,125	237,574
Wyoming	3,847,064	199,836	93,719	1,148	207,018	3,934,749	87,685
Miscellaneous§	123,987	3,203	100	20,654	7,815	140,129	16,142
Total	**262,596,593**	**7,332,840**	**6,637,009**	**226,228**	**13,090,450**	**263,702,220**	**1,105,627**

*Excludes gas loss due to natural-gas liquids recovery. †The net difference between gas stored in and gas withdrawn from underground storage reservoirs, inclusive of adjustments and native gas transferred from other reserve categories. ‡Net production equals gross withdrawals less gas injected into producing reservoirs. Changes in underground storage and gas loss due to natural-gas liquids recovery are excluded. Fourth-quarter production estimated in some instances. ¶Includes offshore reserves. §Includes Alabama, Arizona, Florida, Iowa, Maryland, and Missouri.

known fields — 2,111,472,000 bbl.—compared with 253,856,000 bbl. from discoveries of new fields and new pools.

Last year's 100-million-barrel net decline compares with the previous year's outstanding gain of 1.18 billion barrels.

The reserves setback coincided with a drilling slump to the lowest level since 1952, some 5,000 wells below 1959 (OGJ, Jan. 30, p. 108). And 1960 was only the second below-10,000 wildcat year in a decade.

Among the oil states, 13 showed declines in reserves while 10 had increases. The trend was downward for most of the important states. California fell 104 million barrels, Texas 101 million, and Oklahoma 74 million.

Louisiana was the shining exception among the major producers, with an increase of 125 million barrels. New Mexico and North Dakota also had good years, adding 58 million and 48 million barrels respectively.

Natural-gas liquids . . . While natural-gas liquids reserves increased for the third straight year, the size of the increase slipped for the second year in a row.

Starting with natural-gas liquids reserves of 6.5 billion at the end of 1959, the industry made a gross addition of 725 million barrels. Subtracting production of 431 million barrels left reserves at the end of 1960 at 6.8 billion barrels.

Texas redeemed its bad crude performance with a big increase of 165.8 million barrels in natural-gas liquids reserves. Louisiana and New Mexico matched their good crude records with gains of 75 million and 61.8 million barrels respectively.

Natural gas . . . The gain in natural-gas reserves of 1.1 trillion cubic feet was dwarfed by the 1959 effort which boosted reserves almost 8.5 trillion cubic feet.

The gross additions to reserves last year of 14.2 trillion compared with the previous year's 20.9 trillion. They were reduced by record production of 13 trillion cubic feet.

Reserves from new discoveries of 6.6 trillion cubic feet were the third highest on record, exceeded only in 1953 and 1957. But additions from extensions and revisions of 7.3 trillion were the second lowest of the postwar period.

And the net gain in reserves was also the second lowest since the end of World War II.

New Mexico, the fourth-ranking state in natural-gas reserves at the end of 1959, gave up that position to Oklahoma when it lost 2.3 trillion cubic feet. New Mexico had a poor discovery year and at the same time dropped 1.7 trillion cubic feet from revisions of previous estimates.

Texas made gross additions of almost 5 trillion cubic feet but still had a net decline of almost 1 trillion. Kansas, the third-ranking gas state, declined 372 billion cubic feet and Colorado lost 453 billion.

But Louisiana almost offset these major declines with a net gain of 3.5 trillion cubic feet. Oklahoma was up 648 billion cubic feet, Cali-

U. S. Natural-Gas Liquid Reserves: Thousands of barrels

	Proved reserves 1-1-60	Extensions and revisions	New discoveries*	Production in 1960	Proved reserves 1-1-61	Changes in 1960
Arkansas	32,017	– 2,640	15	1,895	27,497	– 4,520
California†	325,318	16,607	365	28,429	313,861	11,457
Colorado	24,914	2,699	360	3,949	24,024	– 890
Illinois	10,754	850	27	1,578	10,053	– 701
Indiana	124	5	1	20	110	– 14
Kansas	196,912	7,680	930	7,119	198,403	1,491
Kentucky	49,290	2,000	1,000	3,238	49,052	– 238
Louisiana†	1,357,798	113,002	44,466	82,291	1,432,975	75,177
Michigan	1,562	118	156	217	1,619	57
Mississippi	40,944	– 4,598	2,340	2,505	36,181	– 4,763
Montana	13,511	– 2,297	1,101	627	11,688	– 1,823
Nebraska	5,432	1,450	25	752	6,155	723
New Mexico	423,040	86,134	3,972	28,347	484,799	61,759
North Dakota	97,928	– 5,066	.....	1,644	91,218	– 6,710
Ohio	1,304	– 1,304	.....	.....	.....	– 1,304
Oklahoma	367,569	– 5,374	4,601	28,483	338,313	– 29,256
Pennsylvania	3,677	– 1,500	.....	67	2,110	– 1,567
Texas†	3,430,375	335,403	58,537	228,141	3,596,174	165,799
Utah	32,376	20,370	.....	2,044	50,702	18,326
West Virginia	34,166	10,828	3,610	3,870	44,734	10,568
Wyoming	73,279	29,252	3	6,159	96,375	23,096
Miscellaneous‡	18	2	.....	4	16	– 2
Total United States	**6,522,308**	**603,621**	**121,509**	**431,379**	**6,816,059**	**293,751**

*Only a limited area is assigned to each new discovery. †Includes off-shore reserves. ‡Includes Alabama and Florida.

fornia 350 billion, Utah 262 billion, and West Virginia 238 billion.

Alaska, a newcomer to the list, increased its reserves from 58 billion to 108 billion cubic feet.

Canada . . . Alberta led the way in reserves additions in all categories in Canada.

Alberta posted 152 million barrels of the Canadian 181-million-barrel gain in crude reserves, while British Columbia added 25 million and Saskatchewan 6 million. Northwest Te. .itories and Manitoba were down.

Alberta added 21 million barrels to its natural-gas liquids reserves, British Columbia 9.7 million, and Saskatchewan 5.5 million.

It was in natural gas that Canada made its most spectacular gains. Alberta boosted reserves from 23.3 trillion to 26 trillion cubic feet, and British Columbia went from 1.8 trillion to 3 trillion cubic feet.

The increases came almost entirely from extensions and revisions.

While a net gain of 4 trillion cubic feet was being made in natural-gas reserves, Canada raised production to 540 billion cubic feet—a new record.

Canadian Reserves: Crude Oil, Natural-Gas Liquids, and Natural Gas

	Proved reserves 1-1-60	Extensions and revisions	New discoveries*	Production in 1960	Proved reserves 1-1-61	Changes in 1960
CRUDE OIL (Thousands of barrels)						
Northwest Territories	51,970	.....	.....	472	51,498	– 472
British Columbia	19,401	24,529	1,895	869	44,956	25,555
Alberta	2,898,878	268,807	15,394	131,887	3,051,192	152,314
Saskatchewan	495,787	53,643	4,755	52,107	502,078	6,291
Manitoba	23,054	2,446	.....	4,750	20,750	– 2,304
Eastern Canada	8,034	1,053	.....	1,019	8,068	34
Total	**3,497,124**	**350,478**	**22,044**	**191,104**	**3,678,542**	**181,418**
NATURAL GAS LIQUIDS (Thousands of barrels)						
British Columbia	23,297	9,160	1,502	977	32,982	9,685
Saskatchewan	14,925	6,410	.....	862	20,473	5,548
Alberta	463,923	18,479	9,379	6,715	485,066	21,143
Total	**502,145**	**34,049**	**10,881**	**8,554**	**538,521**	**36,376**
Total liquid hydrocarbons	**3,999,269**	**384,527**	**32,925**	**199,658**	**4,217,063**	**217,794**
NATURAL GAS (Millions cubic feet)						
Total in Canada	**26,605,336**	**4,312,815**	**290,058**	**5,435**	**539,592**	**30,674,052**	**4,068,716**

*Only a limited area is assigned to each new discovery.

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INSTRUMENTS THAT MEASURE AND CONTROL FLOW, TEMPERATURE, PRESSURE, &c., &c., &c. have established their reputation for superiority against all competitors through the years. In the realm of fluid flow measurement, Fischer & Porter Company is the

ONLY COMPLETE FLOWMETER HOUSE

We solicit your attention to the outstanding examples noted herewith.

THE HANDIEST GUIDE TO THE VARIOUS AND SUNDRY METHODS PRESENTLY AVAILABLE FOR MEASURING FLOW

It has been our pleasure and profit over the years to aid and assist divers engineers in the estimable task of selecting the one—nay, the *only* device best suited to measuring a given flow. But truly, the years have added, the devices have multiplied, and the task of selection has grown ever more complex. As a result, the "handy" guides, so reminiscent of an earlier day have grown less handy all the time. Let us see how handy we can be.

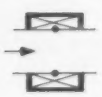
LESSON I

There are but four major types of flowmeters.

1. VARIABLE-AREA

2. VARIABLE HEAD

3. OBSTRUCTIONLESS



4. INTEGRATING

LESSON II

In order to be as handy as possible, we shall limit our discussion of the advantages of the four basic types to a single characteristic benefit.

1. Variable-Area: linear scale
2. Variable Head: flexibility
3. Obstructionless: obstructionless
4. Integrating: accuracy

LESSON III

This lesson is of the most importance as it concerns the various factors necessarily involved in the judicious selection of flowmetering devices. These primary and critical factors are: fluid property limitations, application, installation and economics. We need not go into detail on these factors since our Bulletin 91-119, a veritable gem of condensation, reviews all of these factors in the short space of only six pages. There is a limit as to how short and "handy" such a guide can be.

If you are one of those, and there are many, who philosophically opposes all "handy" guides, then we need only remind you that we make all of the four major types. Indeed, we are the only company to do so. We also wish to state that we use a wide variety of materials to construct these meters including many readout and process control devices. Our laboratories include the finest and most advanced flow measuring and calibrating equipment. A call to our field engineers can save you trouble and bring you a firm recommendation unencumbered by bias or prejudice.

TO THE RIGHT

is a sampling of some outstanding examples of each type of meter in our flowmetering line.

Variable-Area Flowmeters

Fischer & Porter has indeed made its mark in lands far and wide as the leading manufactory of variable area meters, finding itself pleasantly faced with such wide acclaim for ease of use and simplicity that it defies description. Yea, and to no surprise. Indeed our people have labored unceasingly to INTRODUCE EVERY MAJOR ADVANCE in this noble form of flowmetering, to wit: the glass tube that allows viewing the rate of flow directly; the bead-guide and Tri-Flat meter for matchless float stability; the predictable float which simplifies calculations; the metal tube for high pressures and temperatures.

Frictionless! Foolproof!

—herald the fortunate employers of the MAGNABOND coupling developed by Fischer & Porter for detecting the linear motion of the float, with abundant power to operate a multitude of accessories for recording, transmitting, totalizing and controlling. The ingenious detection system employs permanent magnets sealed into a non-magnetic, corrosion-resistant extension unit, and is widely used in conjunction with the popular FLOW-RATOR meters.

The NEW, ALL NEW

MAGNARATOR

with

FLOW INDICATOR

and

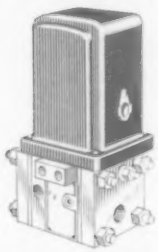
PNEUMATIC TRANSMISSION

This amazing apparatus is distinguished as the TRUE in-line, through-flow meter. Of great joy to installation and maintenance men alike, no extension is needed and there are no

crooks, crannies or corners where material can collect. The MAGNARATOR, kin to the extension-type MAGNABOND flow transmitter, is lofted to great heights of applicability by a new magnetic coupling principle. It measures, indicates and transmits pneumatically with a linear output signal!

Variable Head Flowmeters

...featuring the



DP TRANSMITTER

by the wizards of Warminster

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Outwits PULSATION!
Outwits CORROSIVE FLUIDS!
Outwits STEAM TRACING PROBLEMS!

This popular differential pressure transmitter undeniably supports its claim as being the best in the world. Since it was first presented to the metering public its success has been remarkable. WHY? Its superiority over all others is substantiated by the FACTS OF ACTUAL USE!

ASTOUNDING ADVANTAGES

found in no like instrument

ADJUSTABLE DAMPING in the differential sensing system, Gentlemen, which is where it should be. We warrant there to be no other method that lets you measure PULSATING flow without zero shift, PHANTOM signals, diaphragm fatigue or premature parts failure.

NEW METALS & ALLOYS such as Tantalum, 316 Stainless and Monel are STANDARD materials of construction for the sealing DIAPHRAGMS. Other "wetted" parts are fabricated from 316 Stainless, Monel, Nickel and Hastelloy C—as you desire. A perfectly sealed measuring chamber filled with the celebrated silicone oil PROTECTS ALL WORKING PARTS.

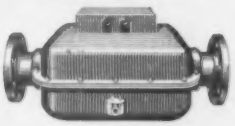
INTEGRAL STEAM TRACED PROCESS FLANGES, available from our shipping shelves, enables one to conveniently heat process connections to prevent fluids from "freezing"—all without TROUBLESOME AND EXPENSIVE lagging and tracing in the field.

Obstructionless Flowmeters

THE JUSTLY CELEBRATED MAGNETIC FLOWMETER

OF FISCHER & PORTER

one of the very best instruments ever invented



An unobstructed length of pipe that accurately measures the flow of even the least conductive fluids by the Invisible MAGNETIC FIELD. Extends the range of accurate flowmetering to heretofore unbelievable limits. A rangeability of 3000:1! Measures the flow of any liquid with a conductivity of no less than 0.1 micromho per centimeter.

Measures flow IN EITHER DIRECTION and without auxiliary equipment. Handily provides full scale recording of ANY FLOW RATE from 1 to 30 feet per second at the TURN OF A DIAL.

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Fully Transistorized Recorder

Years ahead of its time! An instrument of the future which you can profitably use today. The new recorder incorporates compact transistorized circuits which have reduced space requirements incredibly. Now the entire instrument is contained in a SINGLE DEPTH CASE. No black boxes to add. All amplifiers are mounted on plug-in cards.

Gentlemen, the Magnetic Flowmeter itself represents the GREATEST ADVANCE in flowmetering in the last quarter century!

YOUR ATTENTION INVITED!

Integrating Flowmeters

TURBINE METER

Here is the zenith in flowmetering of the greatest accuracy over a wide range, designed for the most fastidious users. Each and every revolution of the bladed rotor in the TURBINE METER signifies the passage of a definite unit of fluid volume with an ELECTRICAL pulse. The total number of counts is proportional to the total volume of FLUID PASSING THROUGH the meter.

NEW! NEW! NEW

TRANSISTORIZED
READOUT DEVICES

The Turbine Meter can be linked with any of an unbelievable number of Readout Devices to oversee your process operations. Exemplary devices, utilizing the most up-to-date transistorized electronic components and techniques can indicate, totalize, record and control.

Continuous In-Line Blending

NOW A FACT

Triumph at last. To the marriage of the amazing Turbine Meter and Marvelous Electronic Readout Devices goes a new distinction. Together they have brought to reality a truly Continuous IN-LINE BLENDING System for blending of two or more fluids. This combination offers to you many other solutions for conquering DIFFICULT & DEMANDING & COSTLY flowmetering operations.

STATE YOUR PLEASURE, GENTLEMEN!

To better acquaint our public with the BENEFITS and ADVANTAGES of our UNIQUE products we have caused to be printed handsome booklets for the general edification. We will gladly post to you a selection of these works upon your application. It will only require an expression as to the type of meter(s) of interest, that is Variable-Area, Variable Head, Obstructionless and Integrating and also our "handy" Guide (91-119). We are your obedient servants in this as in all other matters.

FISCHER & PORTER CO.
WARMINSTER, PENNSYLVANIA & TORONTO, CANADA

A world-wide INSTRUMENT COMPANY with plants in Australia, England, France, Germany, Holland, Mexico, as well as the U.S.A.

THREE CAISSON-TYPE LEGS support Offshore Co.'s new self-elevating deepwater mobile rig now drilling in British Honduras' offshore waters.

Offshore Rig Has Novel Look

• New mobile, self-elevating unit has the usual rectangular shape—but it's supported by only three legs.

A DRILLING-barge-and-tender combination, rarely used in the past, is punching its first hole beneath the offshore waters of British Honduras.

Offshore Co.'s Rig 58 has a novel design: It is rectangular in shape but is supported by only three legs instead of four.

Rig 58 was designed by the engineering department of Offshore Co. and built by J. Ray McDermott & Co. at its Bayou Boeuf yard near Morgan City, La.

Offshore Co. reported last week that the rig had performed admirably during the first 2,000 ft. of drilling in the Gulf of Honduras for Phillips Petroleum Co.

Features . . . Rig 58 has most of its weight in the forward section where the drilling slot is located.

Two of the 140-ft. caisson-type legs are forward and the third is aft. Forty-foot extensions to the legs are available on board the barge and will be used in waters up to 100 ft. deep. Drilling currently is in 22 ft. of water, but operations at greater depths are planned.

Each of the 6-ft.-diameter legs has a 500-ton hydraulic pin jack for raising.

The barge itself is 97.5 ft. long and 80 ft. wide, and has a hull depth of 12 ft. The drilling slot, 30 ft. by 22.5 ft., permits cantilevering the derrick 8.5 ft. over the side.

The 30-ft. by 136-ft. derrick has an 800,000-lb. capacity and a special 1-million-pound-capacity substructure. The A-1100-E Continental-Emsco draw works is powered by two 650-hp. electric motors. An auxiliary quad engine is available.

The tender . . . Pumps for the rig are located on the tender. Two 1,000-hp. pumps are each powered by two 650-hp. motors; one 225-hp. pump is powered by one 650-hp. motor. Three 1,000-hp.-engine generator sets which supply power for drilling also are located on the tender.

The tender is the Offshore Venezuela 2, which has seen use in Lake Maracaibo and fits handily into the company's new mobile-barge operation. It is 180 ft. by 70 ft., with a hull depth of 11 ft. 3 in. It has a helicopter deck, although currently all traffic to the barge and tender is handled by boat.

Since crew members are limited to eight men, the drilling crew of 18 lives in a base camp onshore.

Offshore Co. is so pleased with the performance of Rig 58 that it has designed a sister unit, though slightly larger, and has given McDermott the contract to start construction.

Phillips . . . The well which Rig 58 is drilling is the third drilled in British Honduras by Phillips.

In 1958 the Bartlesville, Okla., operator acquired 1,974,992 acres in exploiting licenses and leases in the southern half of the country. This included extensive offshore tracts.

The two earlier efforts went to 10,750 ft. near Punta Gorda and to 7,872 ft. near Machaca. Both had minor oil shows but were abandoned.

Rig 58 is drilling 5 miles south of Placentia, 3 miles from shore, and is the first test of the offshore acreage.

Bell Gets Intex Control

CONTROLLING interest in Intex Oil Co., Bakersfield, Calif., has been purchased by Bell Intercontinental Corp., an offshoot of the old Bell Aircraft Co.

Bell is acquiring 350,000 shares of Intex at $9 a share. This will put the company's holdings at 371,000 of Intex's 708,800 shares.

L. R. Seaman, Intex president, said no changes in Intex's operations are expected now that Bell has control of the company.

He said most of the stockholders who last year attempted to replace Intex's management have sold to Bell.

Plans for Biggest Miscible Flood Abandoned

- Mobil trims program for setting up world's most extensive miscible-phase project in Canada's Pembina field, because a governmental ruling would drastically cut its advantages. Instead, water flooding will be expanded.

WHAT STARTED as the world's biggest miscible - phase - recovery project in 1959 has been whittled down by a decision to water flood a portion of the project area.

The reason is a ruling of the Alberta Oil and Gas Conservation Board which changed the economics of the LPG-injection program.

Mobil Oil of Canada, Ltd., operator for itself and 29 others in the North Pembina Cardium Unit No. 1, now proposes to water - flood 7,680 acres of the area which had been planned for miscible - phase recovery.

The North Pembina operators propose to restrict the LPG-injection area as a result of the board's January 24 ruling.

The board reduced the maximum permissible rate (MPR), set November 28, from 85 bbl. daily to 69 bbl. daily under the miscible project. The water-flood MPR is 60 bbl. daily.

The board also classified the current two-well injection program as experimental, and suggested extending it to three more wells where miscible recovery had already been approved.

But due to the increased investment for an experiment, and the reduced MPR, Mobil said miscible flooding was no longer more attractive economically than water flooding. The expanded miscible flood, Mobil said, would not pay out within 25 years.

The board's caution toward the miscible project is an outgrowth of a challenge by Imperial Oil, Ltd., as to the engineering soundness of the proposal.

Imperial last fall reported the results of its independent study indicating the miscible process was actually reduced to an immiscible gas drive which would drain an area outside the unit.

Mobil and the other operators in the unit feel that the miscible project is sound from an engineering standpoint and can be controlled.

The conservation board said there was no basis yet for withdrawing its earlier approval of the miscible project.

The North Pembina unit includes 46,000 acres and 573 producing wells. It is about one-seventh of the 300,000-acre field whose total primary reserves have been estimated at a billion barrels.

The North Pembina recovery project was launched a year and a half ago. It was planned to waterflood 33,000 acres and to place the 13,000 acres in the center under miscible flood (OGJ, Sept. 7, 1959, p. 100).

Under the original combination LPG-water flood, recovery in the unit area was expected to be increased from 16% of oil in place under primary means to 49.5% or more. Thus, ultimate recovery of 366 million barrels was anticipated rather than 118 million barrels under primary methods.

Fire Flooding Revives Wells

FIRE FLOODING has brought alive a group of oil wells in Wyoming's Shannon field that have been dead nearly half a century.

The wells, which only produced a total of 53,441 bbl. from the time of their discovery in 1889 until they died away in 1915, have produced 60,000 bbl. of 24°-gravity crude oil in the last 21 months.

Results of the experimental underground-combustion project are termed excellent by Midwest Oil Corp., Denver, owner of the field. Pan American Petroleum Corp. is operating the fire-flood experiment under contract.

Pan American is following a five-spot pattern in the thermal program.

Four old wells were cleaned out in the 160-acre field at the northern tip of Natrona County's famous Salt Creek field. Teapot Dome is at the southern extremity of Salt Creek. Most of these Shannon wells have been shut down since 1915.

The four wells were spotted at corners of a 1.3-acre tract with an injection well drilled in the center. Gas was injected into the pilot area for several months followed by Hydrafrac application.

Four wells had started producing again even at this stage. Air then was injected into the area and underground combustion was set off in May 1959.

Oil has been recovered from all four of the cleaned-out wells plus six wells outside the pilot area which benefited from the heat-recovery program. Total production to date has reached 60,000 bbl. This is estimated at 60% of the oil in place in the pilot area and production is continuing at the rate of about 80 bbl. daily.

"The plan is to expand this recovery method to other wells in the field, as practical," Ralph Collins, Denver, representing Midwest, says.

Originally there were 48 wells in the field. Wellheads of some holes, abandoned or inactive since 1915, are covered with 8 feet and more of creek-bottom silt. Mine detectors are being used to locate them.

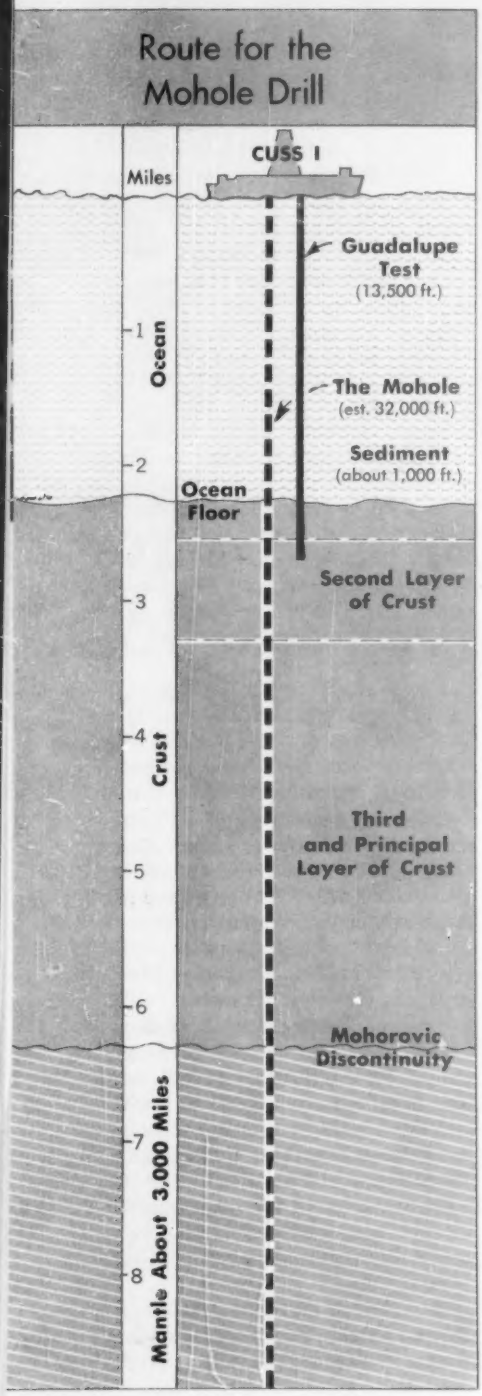
A Bureau of Mines report in 1941 gave this picture of Shannon:

"Shannon wells are small producers, making 5 to 15 bbl. of green paraffin-base oil. About 15,000 bbl. was produced from 1893 to 1896 and was hauled by teams to Casper. Another 38,000 bbl. produced to 1915 was piped to Casper. Quite probably, most of the oil produced to 1907 was used as fuel in developing the area and the Salt Creek Field."

The Bureau of Mines added that Shannon field was responsible for most of Wyoming's reported crude production from 1894 to 1907.

Mohole May Give Oil Men New Drilling

• The first real test of the ideas and equipment dreamed up for the Mohole is going on in the deepest water ever tackled by a drilling crew. Just when the Mohole will be drilled depends on how well this test program goes.



A SHAKEDOWN cruise for the equipment which will drill the Mohole is being launched off the coast of Baja California this week with a drilling crew attempting several things never tried before.

Principal aim of the Moho project is to give scientists new information about the earth and its origin.

But oilmen will profit, too. They should get some definite ideas on what to expect when oil exploration moves into the deep waters off the continental shelf.

The test that starts this week in 12,000-ft. waters is known as the Guadalupe test. It will be conducted 90 miles at sea about midway between Baja California and Guadalupe Island.

Drilling will be done from the CUSS I, a drill ship owned by Global Marine Exploration Co., Los Angeles, contractor for the Mohole. The Guadalupe well was preceded by several core holes in the San Diego Trough off La Jolla.

This preliminary drilling off La Jolla was done in water 7½ times deeper than any drilled in previously. The CUSS I made 1,043 ft. of hole in 3,140 ft. of water. Earlier, 400 ft. of water was the deepest in which any drilling had been done.

Experience gained from the Guadalupe well and other tests will lay the groundwork for the CUSS 1 to move into deeper water—possibly 18,000 ft. to tackle the Mohole.

Target of the Mohole is to drill a core hole through the Mohorovic Discontinuity (Moho for short) and into the mantle of the earth. The discontinuity is the boundary separating the earth's crust from the mantle. It is believed to be about 5 miles below the floor of the ocean.

Just how deep the Guadalupe hole will go has not been determined—in fact, it is something that can't be pinpointed.

Here's what is planned in the Guadalupe well:

The test will be drilled as an uncased hole using only one diamond core bit. There will be no conductor pipe and the only connection between the drill ship and the ocean floor will be the 12,000-ft. string of 4½-in. drill pipe.

Once the bit leaves the hole, that will be the end of the drilling. There is 13,500 ft. of drill pipe aboard the ship, so this is apparently the maximum depth planned at Guadalupe.

Those close to the project point out that while a definite plan has been set up for the Guadalupe hole, this does not mean the same procedures will be followed on the Mohole. Guadalupe, they point out, is just one step in the experimental deepwater drilling that will precede the main project.

Undoubtedly more than one bit will be used to drill the Mohole itself, which means round trips will be made. But just what procedure will be followed has not been determined.

Ocean-floor equipment developed by Global Marine probably will be used. The contractor directs the pipe to the hole with guide wires attached to three cones at the drilling base.

New ideas . . . The problems raised by drilling in such deep water demanded some new approaches before the CUSS 1 could ever leave port.

Oil men and equipment manufacturers throughout the oil patch were called in to help plan the drilling.

Arthur Lubinski, a research associate at Pan American Petroleum Corp.'s Tulsa laboratory, did much of the basic study on predicting how the drilling would progress. C. Don Woodward, a senior petroleum engineer at Texaco Inc.'s Bellaire research lab, was picked to serve as drilling superintendent.

Research was coordinated by the National Academy of Science-National Research Council. The acad-

Methods

emy, a private organization of scientists, is carrying out the Moho project with the support of the National Science Foundation, an independent federal agency.

Lubinski's studies turned up five stresses which might snap the drill string, but two areas appear to be the most critical. These will be the point immediately under the ship and the point where the pipe enters the hole on the ocean floor. Equipment has been designed to alleviate both stresses.

The equipment includes:

. . . A 35-ft. guide shoe shaped like a funnel, 10 in. in diameter at the top and 58 in. at the bottom. The drill string will be supported laterally by the shoe, reducing the possibility of fatigue failures due to the pitch and roll of the ship. The shoe will permit a 14° roll of the ship before a critical stress develops.

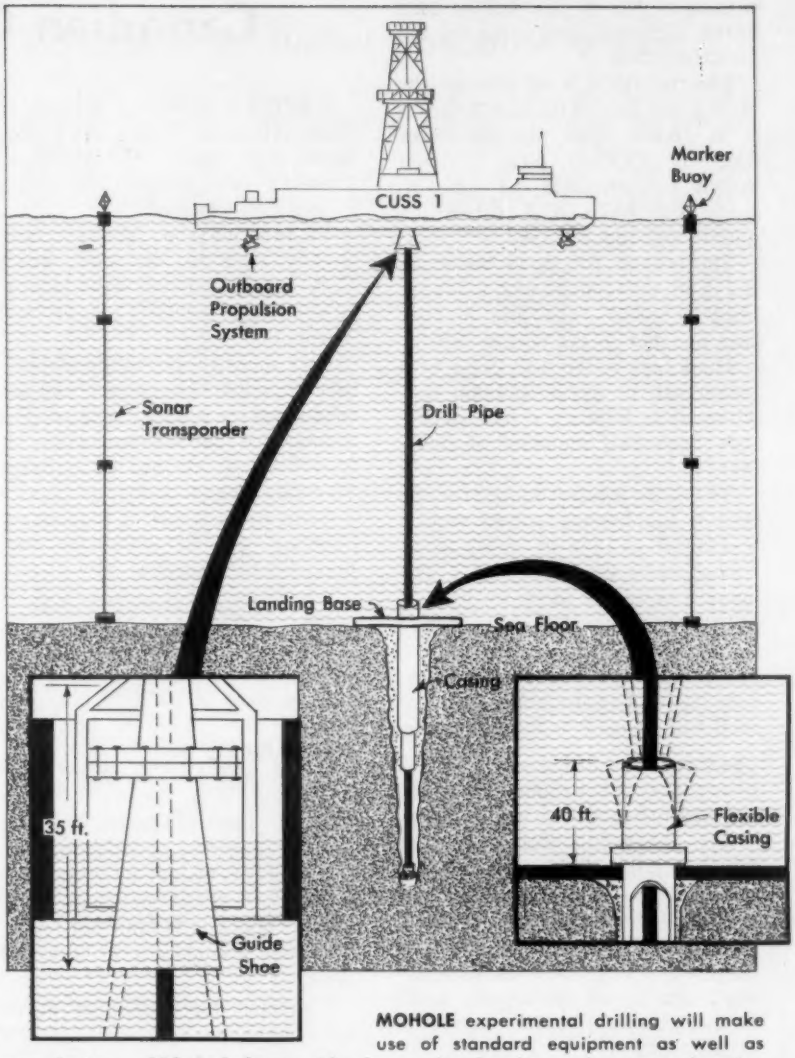
Possibilities of a failure at the top of the string will be great because the top joints will be under the tension of the entire string of pipe.

. . . A tapered section of casing which will be attached to the landing base. This special 42-ft. length of casing will extend 40 ft. above the ocean floor and will have a wall thickness ranging from ⅛ in. at the top to ½ in. at the bottom. It is designed to allow the drill pipe to bend 8° from the vertical at the ocean floor.

There will be 100 ft. of regular casing underneath the base to prevent the unconsolidated sediments from caving in the hole. The drill pipe inside the casing will be supported by the flexing of the tapered section so that it will not kink.

Too, the bottom 500 ft. of the drill string will have four bumper subs with a total stroke of 20 ft. The bumper subs are common in Global Marine's offshore work. They permit the pipe to adjust to the heave of the ship since they are hung with sliding joints.

Bending on the ocean floor will be caused by the CUSS 1's drifting off location. The ship is expected to drift from 200 to 300 ft. off center since it will be unmoored. It will be held in position by four 200-hp. diesel engines, two mounted forward and two aft.



MOHOLE experimental drilling will make use of standard equipment as well as new devices, which include a guide shoe under the ship and a tapered casing at the landing base. Both of these are designed to aid string flexibility.

A system of buoys will be spotted around the ship to feed positioning information to the bridge by radar and sonar. Six of the buoys will be 200 ft. underwater and anchored to the ocean floor.

One of the reasons for the early trial runs near San Diego was to see how well this positioning system worked.

Lubinski has discounted the threat of any serious trouble from subsurface currents. And he sees no great danger in the tendency of drill pipe to whip, causing transverse vibration, if rotary speeds do not exceed 40 r.p.m. He says the sea water should work to eliminate this vibration.

A resonant condition caused by sound traveling up and down the drill pipe also could cause a pipe failure, but Lubinski says pipe protectors on the drill string will reduce this danger to a minimum.

Coring . . . Special wire-line coring equipment was built for the Mohole.

The coring assembly has a 6¾-in. o.d. and is designed to handle several combinations of inner assemblies. One punch core for soft formations will take a 2-in. core 10 ft. long. Swivel-type core barerls for harder formations will take 2 7/16-in. cores up to 20 ft. long.

Core barrels and bits were manufactured by Christensen Diamond Products Co. and the outer barrel by Servco.

Drilling string . . . Three different

weights of 4½-in. pipe will be used in the 13,500-ft. drill string for the Guadalupe test.

The top 1,500 ft. of pipe weighs 20 lbs. per foot. The middle 3,500 ft. is 16.6-lb. pipe and the lower 8,000 ft. 13.75-lb. pipe. National Supply Co. provided the 8,000-ft. string and Jones & Laughlin the middle and top sections.

The bottom 500 ft. of the string is 7½-in. drill collars with a 3½-in. inside diameter. The four bumper subs are part of the bottom 500 ft.

Hook load of the drill string with casing will be about 250,000 lbs., which is a little over half of the rig's hook-load capacity of 550,000 lb.

The only casing figured in the load is the special tapered section and 100 ft. of 10¾-in. casing which will go under the landing base. The amount of casing to be set in later holes may vary with what is used at Guadalupe.

Sea water will be used as a circulating fluid on the wells, but some mud will be used to flush the hole.

The future . . . Just how long it will be before CUSS 1 moves on to drill the Mohole is still a big question.

The Guadalupe well and other test core holes will answer some of the questions, but they also may raise new problems.

All in all, drilling the tests will be just like any other wildcat-drilling program—all the answers won't be available until the bit reaches the target depth.

Commingling Probe Set

NEW MEXICO's Oil Conservation Commission is getting ready to crack down on abuses of commingling procedures.

In letters to operators throughout the state, the commission said it will name an industry committee to review all phases of commingling.

A. L. Porter, Jr., secretary-director of the commission, says that after a committee makes a review a set of minimum standards will be drawn up for all commingling installations in the state. This will include those already authorized.

The commission says discovery of any abuses in commingling, the practice of mixing production from various sources, will lead to prosecution of the violator.

Canadian Oil Policy May Face

RAPIDLY RISING imports of Canadian crude oil into the United States may bring a showdown on Canada's new national oil policy sooner than expected.

Imports into the Midwest have already risen to the level which U. S. imports officials have indicated would be the ceiling over the next 3 years.

And an early showdown between the Canadian Government and the oil companies is also indicated. For estimates of first-half production are 25,000 to 30,000 bbl. daily below oil-policy targets.

Thus an early test of government handling of the voluntary program—with a threat of imports control hanging over it—appears in the cards.

The new Canadian policy, announced in early February, set production goals of 625,000 bbl. daily by mid-1961, 640,000 bbl. daily average for the entire year of 1961, and 800,000 bbl. daily by 1963 (OGJ, Feb. 6, p. 88).

U. S. imports-control officials were advised that to meet the 1963 goal, Canada would have to boost exports of crude and natural-gas liquids about 125,000 bbl. daily. The 1960 average was 113,000 bbl. daily.

Canadian representatives in the U. S. gave the impression that the bulk of the increase—105,000 bbl. daily—would go to the Puget Sound area of Washington, now supplied entirely by foreign crude. And the other 20,000 bbl. daily would go to the Great Lakes area.

Thus, the Canadian policy would be fulfilled with virtually no displacement of domestic U. S. crude.

Midwest imports . . . But the market situation seems to dictate a sharper increase in the Midwest, and events are bearing this out.

Last year's imports into the Great Lakes area averaged 62,000 bbl. daily. At the beginning of the year the level had risen to almost 73,000 bbl. daily.

Imports will average around 80,000 bbl. daily the first 4 months, according to estimates filed with Alberta and Saskatchewan authorities. And the first-half average will be above 83,000 bbl. daily — 21,000 bbl. daily above the average for all of last year.

The increase has come at three refineries which began taking Canadian crude late last year—Mobil Oil Co. at Trenton, Mich., Gulf Oil Corp. at Toledo, Ohio, and Standard Oil Co. (Ohio) at Toledo.

Their imports during the first 4 months will average an estimated 20,750 bbl. daily—8,250 for Mobil, 5,000 for Gulf, and 7,500 for Sohio.

Sohio nominated 6,000 bbl. daily of Alberta crude during the first 3 months of the year and doubled its nomination for April.

Moreover, the opportunity for the biggest single market increase also lies in the Midwest. It is the Standard Oil Co. (Ind.)-Pembina plan to import Alberta natural-gas liquids, starting at 50,000 bbl. daily and building to 70,000 bbl. daily.

Hearings on this proposal have been completed, and a decision is expected this spring.

Puget Sound imports . . . Canada also is making progress in expanding its market in the Puget Sound area of Washington.

Imports there have climbed from a 1960 average of 46,500 bbl. daily

PIPELINE

Two laterals will be built by East Tennessee Natural Gas Co., both taking off from its 22-in. main line. A 10.1-mile 4-in. Carthage lateral will serve South Carthage, Tenn., and a 13.4-mile 6-in. Monterey lateral will serve Pleasant Hill, Tenn.

Both gathering and transmission facilities will be installed by Overland Pipeline, Inc., Wichita, Kans., to serve the Lone Tree field in Wyoming. The transmission line will connect with the Plains pipeline division of Franklin County Coal Corp. Wyoming's PSC is considering the proposal.

The Prairie Creek and Bertha fields in Campbell and Cook coun-

Showdown Soon

to an estimated 75,100 bbl. daily for April, according to nominations filed with the Alberta board. The May and June estimates are for 74,000 and 77,000 bbl. daily, respectively.

Much of the Puget Sound increase has been provided by Texaco Inc., which boosted Alberta imports into Anacortes from 11,500 bbl. daily in January and February to 16,000 bbl. daily in March. And Texaco has nominated 40,000 bbl. daily for April.

Shell at Anacortes will take 13,000 bbl. daily in March and April. And Mobil at Ferndale, Wash., will average about 24,000 bbl. daily in the first 4 months.

If Texaco continues its Alberta take at the April level, it will mean a substitution for Far East crude which has been up to now the principal source of supply.

This is what Canadian authorities have been pressing for. It would accomplish the market expansion called for in the national oil policy, at the expense of other foreign crude. Canada therefore would avoid a crackdown promised by Interior Secretary Stewart L. Udall if the domestic industry is hit too hard.

Strike in Northwest Canada Promising

IMPERIAL Oil Limited and Sun Oil Co. have a gas discovery at their joint venture in the Netla Lake region of Canada's Northwest Territories.

The Imperial-Sun Netla No. D-7 flowed at rate of 7,000 M.c.f. daily on test and currently is being tested further to determine full potential. Testing is centering in a 50-ft. Slave Point interval at about 6,400 ft. Total depth is about 7,300 ft.

Location is 45 miles northeast of the Fort Liard settlement and about 135 miles due north of Fort Nelson. Imperial drilled the wildcat on a spread of 437,974 acres acquired under farmout from Sun. The well is the fifth producer for Northwest Territories. Others have been Rabbit Lake, Norman Wells, Celebita Lake, and Peel Plateau.

Gulf Licks Seismic-Reflection Jamming

GULF OIL CORP. has developed an electronic filter that will eliminate "jamming" of seismic reflections in certain troublesome offshore areas.

Gulf calls the development a "scientific breakthrough of particular significance."

The company says it has given Gulf seismic crews their first opportunity to map such important offshore areas as Lake Maracaibo and such prospects as coastal Florida.

The problem confronting Gulf Research & Development Co. was that seismic shock waves travel faster in hard-rock bottoms than they do in soft floors. Under certain conditions the slower moving wave paths from softer materials will collide and tend to cancel returning sound waves from subsurface beds.

Gulf compares the problem with that of a speaker's voice being drowned out by recurring echoes in a large hall.

The research specialists, using an IBM 704 computer to test theoretical answers, designed "complex, unique electronic filters" which would suppress the interfering echoes.

Gulf does not describe the method further.

BRIEFS . . .

ties of Wyoming will be served by a gathering system and an 18-mile 4-in. transmission line slated by Continental Pipeline Co. The project, now before the Wyoming PSC, would connect with the Belle Fourche system at Miller Creek.

Gathering lines have been laid by Columbia Gulf Transmission Co. from Marguerite to Ivanhoe, La. They consist of 9.5 miles of 10-in. line.

A line to tap Holly Ridge field in Tensas Parish, Louisiana, is proposed by American Louisiana Pipe Line Co. The 25-mile 8-in. line would link the company's main transmission system to the field, which has 30 billion cubic feet of reserves. Producers include Pan American, Union Producing, Socony Mobil, Humble, and Tidewater. The proposal has been submitted to the FPC.

A 57-mile gathering system in Hansford and Ochiltree counties of Texas is to be completed by May 1 by Shamrock Pipe Line Co. The 3, 4, and 6-in. system will serve leases in four fields—Hansford, Twin, Share, and Horizon.

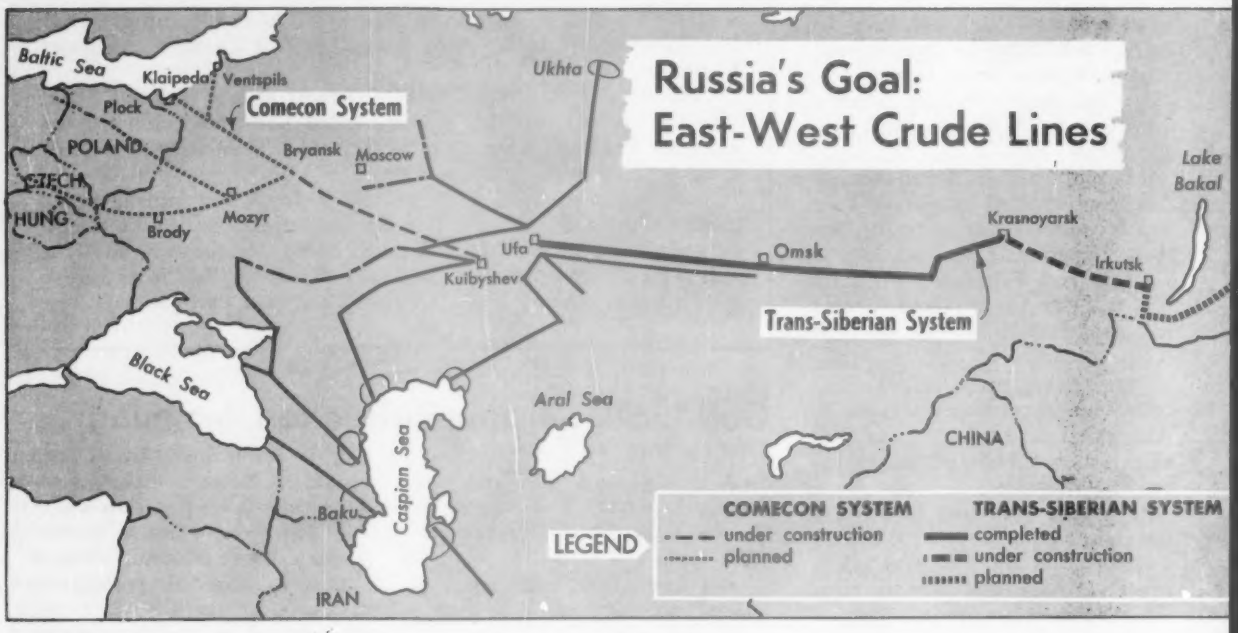
Three projects, all involving 4-in. line, are to be completed this year by Western Slope Gas Co. They include a 7-mile line from Powell Park field to Meeker, Colo., a 4-mile line to Rifle, and 4 miles of gathering lines.

A 34-mile 6-in. line and a 24-mile 4-in. line have been laid between Albany and Fitzgerald, Ga., by South Georgia Natural Gas Co In addition, the company has completed 33 miles of 3 and 4-in. line on the Nashville lateral.

Also for Pipeliners . . .

IN THE NEWS: President's adviser on regulatory agencies reveals his plans to overhaul the FPC in exclusive interview (p. 55) . . . TGT executive gives factors behind in-place gas sales, tells why this new method will expand (p. 62) . . . Russians plan to extend Trans-Siberian pipeline system to the Sea of Japan and the Comecon line to Baltic (p. 76) . . .

PLUS THESE TECHNICAL REPORTS: How to lower a line by hand (p. 90) . . . Pipeline construction report (p. 121).



Pipeline "Girdle" Planned for Russia

• Soviets plan to extend Trans-Siberian system to Sea of Japan, Comecon line to Baltic. This would give them new oil routes to Atlantic and Pacific.

Ray Gibson
District Editor

RUSSIA will start reaping dividends this year from two of its biggest postwar pipeline projects.

One is the 2,800-mile Comecon system, which will carry crude westward from Second Baku to eastern Europe. It will be in partial operation by the end of 1961 (OGJ, Nov. 14, 1960, p. 124).

A branch of this system eventually will extend to the Baltic Sea, a gateway to western oil markets.

The other pipeline is the 2,300-mile Trans-Siberian system, which will carry crude from Second Baku deep into Central Siberia. This line is already in partial operation.

The Soviets say they plan to extend the Trans-Siberian system farther eastward all the way to the Pacific Ocean.

Crude deliveries through the two systems will go a long way toward easing a transportation pinch in Russia.

Last year's completion of 3,726 miles of crude and products lines was a sharp drop from the 1959 showing. And it was considerably below the government's target.

39-in. line pipe . . . An official government newspaper, Izvestia, reports that diameter of pipe in the Kuibyshev-Bryansk section of the Comecon system, now under construction, is 1 meter, or 39.37 inches.

The newspaper says this 800-mile section will have the largest capacity of any long-distance crude line in the world.

Russia plans to loop the 1-meter artery later, since it will feed new refineries in western Russia as well as Comecon outlets in eastern Europe and a branch to the Baltic.

The name Comecon is derived from a joint economic association of Russia and its satellites — the Council for Mutual Economic Aid.

Work on the initial section of the system has been slow. Construction started in 1956, before the Soviets disclosed where Comecon was going. At the start of this year, spreads had reached Michurinsk, about two-thirds of the way to Bryansk.

Spreads also are working on a 200-mile section between Brody and Uzhgorod on the Czech border.

This segment crosses the Carpathian Mountains and is regarded by the Russians as the toughest to build. Construction started last fall and by February 1 only about 15 miles of pipe had been laid. Pipe diameter on this section has not been disclosed.

Czech crews are now laying a 250-mile section from the Russian border to a refinery at Bratislava on the Danube River. Work began in September 1959 and is scheduled for completion this fall.

Bratislava is scheduled to receive crude via completed sections of the Comecon line, starting this fall. Second Baku oil will travel by pipeline from Kuibyshev to either Bryansk or Mozyr, depending on which

of the sections are completed first.

From Mozyr or Bryansk, crude will be shipped 300 or 500 miles by rail to Brody, and then it will be shipped the rest of the way by pipeline.

Other work . . . Preliminary work has started on an 80-mile extension of the system from Czechoslovakia into Hungary.

Less work has been done on the northern leg of the Comecon system, which branches at Mozyr. Neither Russia nor East Germany has started work on this section.

Poland, by February 1, had completed 56 miles out of the 420 miles of Comecon line within its territory. Polish spreads are working near Plock, where the first unit of a 40,000-bbl. refinery will be completed in 1963. The plant will operate on Second Baku crude taken from the pipeline.

The East German terminal of the system will be at Schwedt, on the Oder River.

Baltic outlet . . . A crude pipeline on the Baltic definitely is planned by Russia, but there is doubt about which port will be the terminal point. Izvestia published a map showing a branch line extending from the Comecon system at Bryansk to the vicinity of Klaipeda (Memel), Lithuania, on the Baltic.

Another Russian newspaper, Sovetskaya Rossiya, has said the Comecon branch will terminate at Ventspils, Latvia, more than 100 miles north of Klaipeda.

But whether a terminal is planned for Klaipeda or Ventspils, or both, there is no doubt about why the line is being built. Said Sovetskaya Rossiya: "From Ventspils, oil will be carried by tanker to western European nations."

There have been no official reports that construction has started on the Bryansk-Baltic line, however, and completion is probably several years away.

Trans-Siberian system . . . When the final link of a 2,300-mile 28.5-in. crude line from Second Baku to Angarsk refinery—near Irkutsk in Central Siberia—opens this year, a major transportation burden will be lifted from the Trans-Siberian Railroad. The pipeline will relieve the chronic oil shortage in Central and eastern Siberia, and facilitate oil shipments to China and North Korea.

The line was scheduled for completion late last year but work still is under way on the final section east of Krasnoyarsk. Angarsk refinery was put on stream last year, with crude arriving by rail over the final section of the pipeline route.

Russia's announced plan to extend the Trans-Siberian pipeline to Khabarovsk "and the shores of the Pacific Ocean" presumably means a link with Vladivostok. Completion of such a project, together with a line to the Baltic, would provide both Atlantic and Pacific outlets for Second Baku crude.

The Comecon and Trans-Siberian systems originate in oil fields less than 100 miles apart. In effect, this will give the Soviets a distribution system of more than 6,000 miles—from Schwelt, East Germany, to Vladivostok.

Pipeline problems . . . Russia started extending its Trans-Siberian system eastward from Omsk in 1956. But progress has been slowed by pipe shortages, poor quality pipe, and inadequate equipment. Other Soviet oil - and - gas - transmission projects have similar problems.

Russian pipe mills frequently are criticized in the Soviet press for low production or poor quality.

Russian officials have denied that a domestic shortage motivated a recent deal with Italian firms for an exchange of crude for 240,000 tons of large diameter pipe and other equipment. But there is no doubt that Italian and other free-world pipe will be a big help to the Soviet's pipeline program in the next few years.

Crews working on the Trans-Siberian system have a special problem to contend with: The Siberian winter. Every year, with the coming of cold weather, water freezes in pipes subjected to hydraulic testing.

Special air compressors have been designed to test the sections with compressed air. But so far, the equipment has not been delivered.

Syria plans to take bids for exploration work

SYRIA plans to open bidding soon on exploration concessions in selected parts of the country.

Rights to be offered include acreage bordering Suwaidiyah and Karachuk oil fields in the northeast corner of the country.

Ironically, Karachuk, found by a private operator, J. W. Men Hall, was nationalized less than 3 years ago after Atlantic Refining and Portsmouth Steel had taken an interest in the operation.

Karachuk is being developed by the government, and is scheduled to open in 1964 with an initial output of 40,000 bbl. daily.

While some Russian equipment is being used, the government also is preparing to ask for bids for development wells and construction of field storage facilities.

A West German firm, Soc. des Petroles Concordia, a subsidiary of Deutsche Erdol, is carrying on evaluation work at Suwaidiyah.

When the government took over Karachuk, it charged that drilling did not extend over a large enough area. Another charge was that an interest was transferred to Atlantic Refining without approval.

A 500-mile pipeline to a terminal on the Mediterranean is expected to be built by the time Karachuk is ready to open.

Deep Wildcat Slated in Queensland

A 12,000-FT. wildcat in the center of Australia's Great Artesian basin in the state of Queensland will be started about mid-April as a joint venture of Phillips Petroleum Co. and Sunray Mid-Continent Oil Co.

Location for Buckabie No. 1 is 130 miles west of Charleville and 30 miles north of Quilpie railhead at Lat. 26° 12' S and Long. 144° 16' 30" E.

The well is on a block of 2,500,000 gross acres in which Phillips and Sunray have equal interest. The two also have equal interest in 31,000,000 acres in adjoining blocks.

The Australian Government recently approved a petroleum-search subsidy of £200,000 for the wildcat. In addition Phillips, as operator for the partnership, was granted additional subsidies for seismic survey work totaling £49,000 for the Georgina basin and £56.000 for work in the Quilpie area.

Philippines Bill Seeks Market Tie-Up

A PROPOSED Philippines law that would create a marketing monopoly for a new refining and marketing firm is meeting opposition.

Three representatives in the nation's lower house withdrew their sponsorship of the bill after objections were raised in public hearings held in the Senate.

Bill 662, now under consideration, would grant 20% of the country's present markets and all future demand growth to Filoil, owned 75% by Philippine interests and 25% by Gulf Oil. Filoil has awarded construction contracts for a 10,000-bbl. refinery.

The proposal would create a market for Filoil by freezing other marketers at their 1957 volume of business.

Companies affected would be Caltex, which operates a 26,000-bbl. refinery at Batangas Bay, Stanvac, which recently completed a 25,000-bbl. refinery on Bataan, and Royal Dutch-Shell, which is building a 25,000-bbl. plant at Tabango.

Stanvac's president, H. F. Prioleau, called the bill discriminatory and said it eventually would end the benefits which competition brings to the Philippine consumer.

"If passed, it would seriously affect Stanvac's large investment in the Philippines, as well as the investments of other petroleum companies," he said.

New Petrochemical Plant Set in Israel

A NEW Israeli company has been formed to build and operate petrochemical facilities near the Haifa refinery.

Israeli Petrochemical Industries Ltd. plans to build units to produce yearly 1,500 tons of ethylene, 6,000 tons of polyethylene, 20,000 lb. of carbon black, and 6,000 tons of feedstocks for detergents. The facilities will be operated as one unit.

One-third interest in the facilities will be held by Haifa Refineries and Paz, Ltd. Haifa Refineries is held by the Israeli Government and a British financier, Sam Wolffsohn. The latter also controls Paz, local successor to Shell.

Another third interest is held by a U. S. investors' group led by Max Fisher, president of Detroit Oil Refining & Marketing Co. Other partners include Israel Investors Corp., New York; M. Wechsler, formerly of National Oil Products of New York; and Rudolf Sonneborn, Inc., New York, parent company of Sonol Israel, a marketing firm.

The remaining third ownership is held by a South American group that includes Yoel Oslovitz of Argentina, A. Feffer of Venezuela, and Israel Discount Bank (Overseas), Ltd.

Exports valued at $1.8 million were shipped last year by United Petroleum Export, Ltd., a joint company set up by Paz, Sonal, and Delek, and Haifa Refineries.

Products including gas-oil, kerosine, and asphalt were sold in Belgium, Germany, Turkey, and Sierra Leone. They accounted for crude refinery runs of 200,000 tons, or about 4,000 bbl. daily.

New Guatemalan refinery marks time in pipeline dispute

BREAUX BRIDGE Oil Refining Co., Houston, has completed a 4,000-bbl. refinery in Guatemala. But that hardly tells the full story.

The refinery is ready to operate, but it has no pipeline outlet to the Caribbean.

Furthermore, a rival refinery with three times the capacity is on the drawing boards, and the competition for markets may be fierce.

The struggle for the Central American market has stemmed—at least partly—from the Guatemalan Government's determination not to let one company have a monopoly.

Breaux Bridge, in partnership with the Royal Dutch Shell interests, completed its refinery near the port city of Puerto Matiasa de Galvez (formerly Santo Tomas) in early March. But its efforts to build a 2-mile pipeline to a privately owned loading wharf at Puerto Barrios were thwarted by the government.

Now the line will be built to the government-owned docks at Puerto Matiasa de Galvez if agreement can be reached on the cost of right of way and on charges for crossing the docks.

Breaux Bridge hopes to have the kinks ironed out and the pipeline built in time for a refinery start-up by early June.

A Guatemalan-owned company, Repegua Oil Refining Co., announced plans to build the rival refinery. Its site would be only a mile or two from Breaux Bridge's.

Phillips Petroleum Co. originally was a partner with Guatemalan interests in the Repegua project, but recently withdrew.

A spokesman for Repegua Oil says European banking and equipment manufacturing interests are raising $23 million for the 12,000-bbl. refinery.

Oasis' New Libyan Field Rates as Major Find

A MAJOR new Libyan oil field is shaping up in Oasis Oil's Block 59 in Cyrenaica.

The A3 stepout in the new Waha field is 2¼ miles east of A2 discovery. It tests 4,400 bbl. daily from 6,786 ft., which puts it in the same class as the initial find. The A2 tests 4,440 bbl. daily of 35°-gravity crude from 6,600 ft.

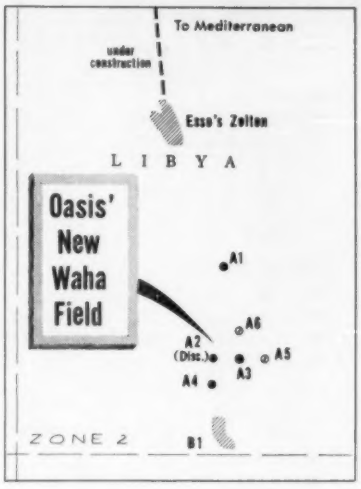
Pay also was found in A4, 2¼ miles south of the discovery. This well still is under test.

Oasis is drilling ahead in two Waha stepouts. One is A5, 2¼ miles due east of A3, which is at 1,400 ft. The other is A6, 2¼ miles due north of A3, which is at 2,500 ft.

The A2 find is Oasis' third and most promising discovery on Block 59. The A1 well, which initially made a poor showing, has been reentered and acidized with good results from a shallower zone. The well is about 8 miles north, and slightly east, of A2.

Three producers also have been completed in the Defa area, 13 miles south of A2, where the B1 discovery was completed last year with a flow of 810 bbl. daily. The latest well, B5, was completed with a flow of 1,980 bbl. daily. Total depth is 6,716 ft.

Waha field is about 35 miles south southeast of Esso's Zelten field. If Waha lives up to its promise, Oasis might be able to build a feeder line to the 30-in. crude pipeline outlet under construction from Zelten to the Mediterranean coast.



Zelten's C22 is currently coring at 5,715 ft., and C23 is drilling at 2,806 ft.

Six producers have been completed since late in November. Their production potential varies from 1,536 to 2,350 bbl. daily through ½-in. chokes. The wells are in the 5,700-ft. range.

Oasis pipeline . . . Oasis, the operator in Libya for three parent companies—Ohio Oil International of Libya, Continental Oil Co. of Libya, and Amerada Petroleum Corp. of Libya—expects to start work by mid-1961 on a pipeline from Block 32 to the coast.

Final approval for the system, to be called Sidrah pipeline, has not yet been granted. But Oasis' schedule calls for crude movements to begin in the last half of 1962.

The 88-mile 30-in. system from Dahra field will have a capacity of 300,000 bbl. daily with gravity flow. Initial throughput will be much smaller. A feeder line will be built from Esso-Libyan American's Mabruk field on the adjoining block to the west.

New French find . . . Cie. des Petroles Total has made a discovery in northwestern Libya southwest of Tripoli. The well is the company's E1 on Block 23.

Flow rate was not disclosed. But the find offers hope of being the French company's first commercial oil in Libya. Output is from 8,100 ft.

The nearest production is about 70 miles south on Block 70, where Shell's A1 came in at 700 bbl. daily, and the A3 at 432 bbl. daily.

Khafji Building Contract Let

- Japanese-owned Arabian Oil Co. earmarks $70 million for offshore production facilities in Persian Gulf.

ARABIAN OIL CO. will spend more than $70 million to erect permanent offshore production and crude-loading facilities in the Persian Gulf off the Neutral Zone.

The Japanese-owned firm has contracted with J. Ray McDermott & Co. to build facilities capable of handling 200,000 bbl. daily of crude from the Khafji concession.

This rich offshore field has yielded high oil production in the 10 wells drilled so far.

All loading will be from a long offshore dock that can handle the world's largest tankers. However, a 26-in. submarine crude line will connect the central gathering station with an onshore terminal.

The land-side facilities will include a gas-oil separator, nine crude tanks of 220,000 bbl. capacity each, a pump station, remote-control equipment, a power station, and living quarters.

Offshore construction will consist of four flow stations along with the central gathering station and tanker loading dock. Gathering lines, flow lines, and other facilities for production and crude handling will be built.

McDermott, which is operating through its McDermott International, Inc., subsidiary, says the project will be operating by June 1962. It will be completed by the following September.

Last year McDermott constructed temporary producing and shipping facilities for Arabian Oil, and these are now going into operation (OGJ, Feb. 20, p. 102).

In announcing the construction plans, McDermott has not pinpointed the location of the offshore terminal. Apparently it will be built in waters at least 45 ft. deep to handle the supertankers and in a spot convenient to the producing wells.

McDermott is expected to fabricate the facilities at its Bayou Boeuf yard at Morgan City, La., and move them by barge to the Persian Gulf location.

Where Foreign Rigs Are Running

	Mar. 1961	Oct. 1960	Mar. 1960
LATIN AMERICA			
Argentina	109	109	101
Bolivia	11	15	9
Brazil	55	39	42
Br. Honduras	1		1
Colombia	12	18	22
Chile	6	4	5
Costa Rica		1	
Cuba		1	1
Dom. Rep.	1	1	1
Ecuador	6	3	5
Guatemala			3
Mexico	104	153	134
Panama	1		
Peru	11	11	9
Trinidad	24	25	31
Venezuela	32	43	50
TOTAL	373	423	414
MIDDLE EAST			
Bahrain	1	1	
Iran	13	14	13
Iraq	6	11	14
Israel	4	4	4
Jordan		1	1
Kuwait	4	3	3
Neutral Zone	6	6	5
Qatar	1	2	2
Saudi Arabia	4	3	3
South Arabia	3	2	3
Syria	2	2	2
Turkey	11	11	11
TOTAL	55	60	61
WESTERN EUROPE			
Austria	9	9	9
France	27	30	50
W. Germany	100	100	105
Greece	1		
Italy	36	36	36
Netherlands	4	4	4
Spain	7	6	8
Switzerland	1	1	
U. K.	2	4	5
TOTAL	187	190	217
AFRICA			
Algeria	44	38	45
Angola	3	3	3
Egypt	18	13	11
Senegal	4	1	2
Gabon	2	6	7
Gambia	1	1	
Libya	31	35	31
Madagascar	1	1	2
Middle Congo	1	1	2
Morocco	1	1	1
Nigeria	4	5	8
Span. Sahara	1	1	
Somalia	2	2	2
Kenya	1		
Tanganyika			1
Tunisia	1	1	1
TOTAL	115	109	116
ASIA-PACIFIC			
Australia	4	4	5
British Borneo	2	2	2
Burma	3	3	4
Formosa	1	1	1
India	11	8	6
Indonesia	12	15	15
Japan	15	15	15
New Guinea (inc. Papua)		1	1
New Zealand	2	2	1
Pakistan	4	5	5
Philippines	1	3	3
Timor	1	1	1
TOTAL	56	60	59
GRAND TOTAL	**786**	**842**	**867**

NOTE: Estimates are made where complete up-to-date reports are lacking.

Overseas Rotary Drilling Falls Off Slightly

- Number of rigs making hole abroad stands at 786 this month, a drop of 56 since last fall and 81 below March a year ago. U. S. drilling's slow, too.

THE LATEST Journal tally shows a decline in the number of rotary rigs making hole in foreign areas compared with either last fall or a year ago.

There were 786 outfits on new wells this month—56 fewer than in October, and 81 fewer than in March 1960.

The slackoff in activity comes at a time when U. S. drilling also is slow. There were 1,560 outfits drilling in the U. S. early in March. Canadian operators had 182 rigs active.

The over-all total for the free world is 2,528.

Pemex operations have taken the sharpest reduction in comparison with last fall.

This is largely due to a seasonal factor. There are now 70 Pemex operated rigs, and 34 contractor operated rigs active in Mexico. Activity is expected to pick up in May, when the rainy season ends.

Iranian action . . . Thirteen rigs are making hole in four separate drilling programs in Iran.

Four of the outfits are in National Iranian Oil Co. areas of operation. Alborz 9 is at 3,953 ft., Sarajeh 5 is at 6,340 ft., and Sarajeh 6 is at 7,574 ft. A new wildcat, Sari 1, in North Central Iran a few miles south of the Caspian Sea, is at 3,610 ft.

The Consortium group has five rigs active. Three are on Gach Saran development wells Nos. 31, 32, and 33. Ahwaz 8 was spudded in the last week in January. The fifth rig is drilling an exploration well, Pazanun 5A, to test an oil show in an established gas field.

Three wells are drilling in Iranian waters of the Persian Gulf. SIRIP's A-1, a joint ENI-Iranian venture, is being sidetracked at 6,882 ft. This is its second well drilled from a fixed platform at the head of the gulf (OGJ, Mar. 20, p. 86).

A test shipment of 18,000 tons—about 135,000 bbl.—of crude from SIRIP's first well was sent to Italy on March 3. The discovery is rated at 3,500 bbl. daily.

An onshore wildcat at Sequta in SIRIP's Zagros Mountains concession is being sidetracked at 7,815 ft.

Testing is in progress on two deep offshore wells being drilled by IPAC, a joint Indiana Standard-government venture. A-1 is at its final depth of 13,151 ft., with the last casing set at 11,500 ft. B-1 has reached a final depth of 12,497 ft.

new Dowell acidizing aid boosts production–improves success ratios

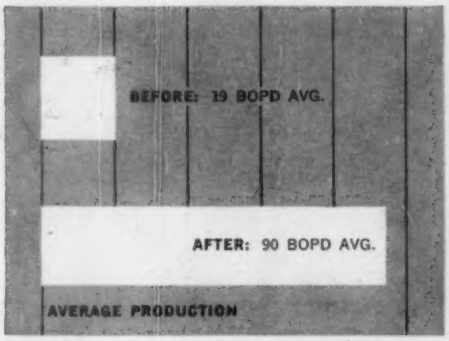
Slugs of gelled water injected between batches of acid are effective temporary plugs when acidizing long pay sections. Here are results from 21 wells.

Operators in many areas have found that Dowell water gels provide an economical temporary plug for use in the selective acidizing of long pay sections. These gels contain a breaking agent which causes the gelled water to revert to a thin liquid, primarily by hydrolysis. Breakdown time varies with gel concentration, the presence of acid, and temperature. Overall treatment cost to the operator is often unusually low for the production improvement realized.

As an example, 21 oil wells in the delta area of South Louisiana were acidized using slugs of water gel between stages of acid. Production was from a series of dirty, poorly consolidated Miocene sands interbedded with silt, clay and mudstone. Depths of these wells ranged from 6400 to 11,000 feet. Here is a tabulation of results from all 21 wells:

WELL NUMBER	LOCATION	PRODUCTION BEFORE TREATMENT, BOPD	PRODUCTION AFTER TREATMENT, BOPD
1	WEST DELTA	8	8
2	WEST DELTA	63	312
3	WEST DELTA	0	17
4	WEST DELTA	41	144
5	WEST DELTA	30	216
6	WEST DELTA	42	140
7	WEST DELTA	0	223
8	WEST DELTA	35	108
9	WEST DELTA	60	203
10	WEST DELTA	0	30
11	WEST DELTA	20	22
12	WEST DELTA	24	24
13	WEST DELTA	7	35
14	DELTA FARMS	0	0
15	DELTA FARMS	0	300
16	STELLA	0	20
17	GRAND BAY	0	0
18	EAST BAY	22	35
19	EAST BAY	17	25
20	EAST BAY	3	0
21	MAIN PASS	26	32

Length of perforated intervals treated ranged up to 50 feet. Some treatments used as many as four stages of acid separated by three water gel slugs. Quantities and number of stages were engineered to meet well conditions.



Out of the 21 treatments, 15 showed a definite improvement. The success ratio of 71.5 per cent and the average production increase of 370 per cent were both considered excellent.

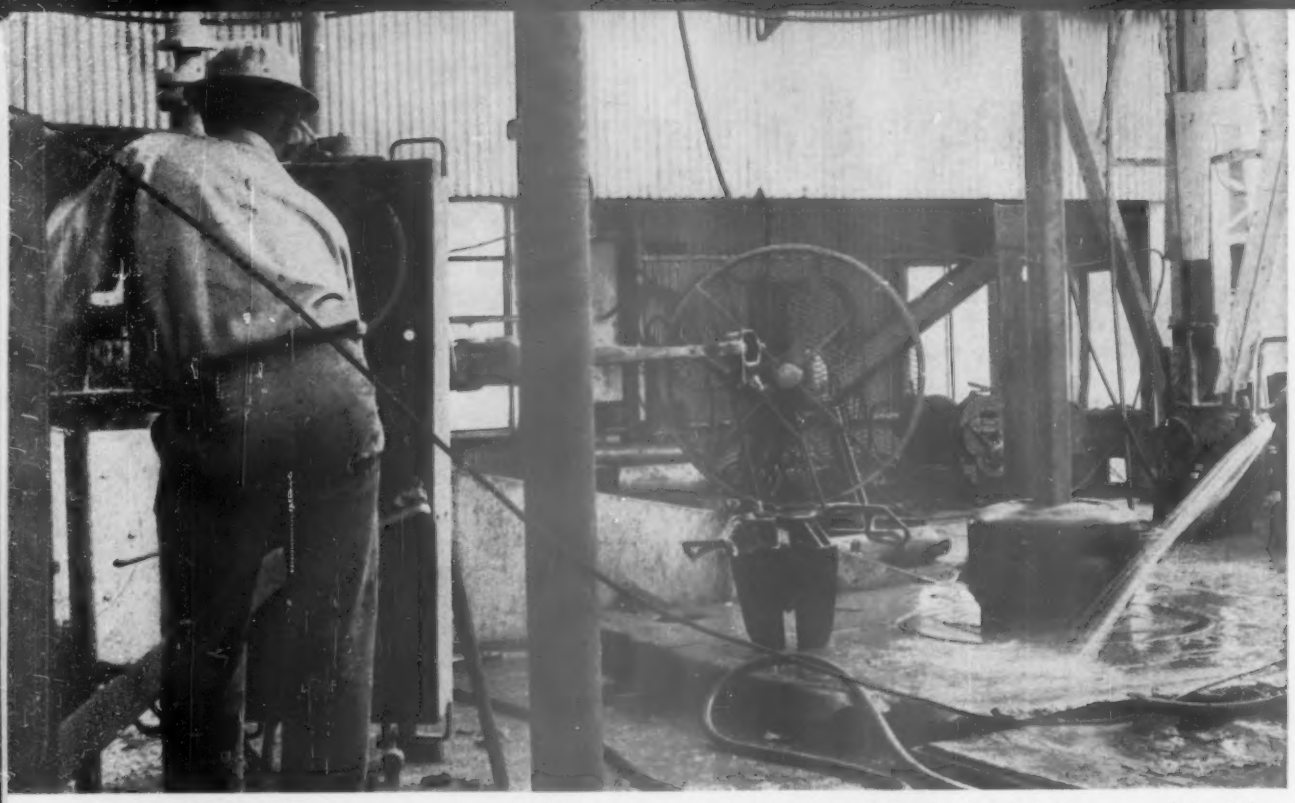
As shown above, this water gel, made from water and a Dowell addition agent, is free of solids. It serves well as a temporary plug, yet it thins readily. Viscosity can be tailored to suit well conditions.

When you consider acidizing a long pay section, check with your Dowell representative about water gel slugs. These gels have been used successfully in many areas. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, Germany, France and the Sahara area. Dowell, Tulsa 1, Oklahoma.

SERVICES FOR THE OIL INDUSTRY

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY



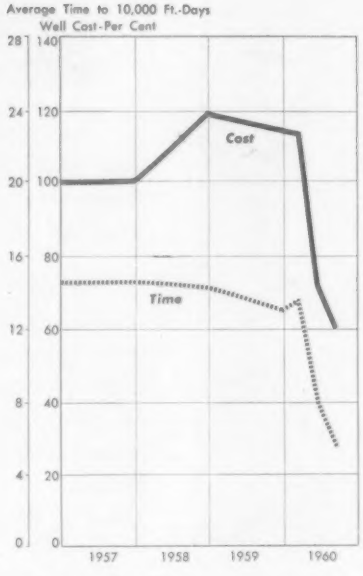
HIGH ROTARY SPEED was one of elements which allowed this rig to drill to 10,000 ft. in only 3.34 days. Mobile offshore rig is one of several which drilled ultrafast wells for Gulf in Timbalier Bay.

Gulf hits 10,000 ft. in 3.4 days to set

RIGS WORKING for Gulf Oil Corp. have drilled a number of unusually fast wells in South Louisiana recently. All these passed the 10,000-ft. level in less than 5 calendar days. Four of the latest, drilled where the best offset wells required 10 days, passed the 10,000-ft. mark in less than 4 days. The last and fastest one on record was drilled in 3.34 days.

These records are the outgrowth of a distinctive, clear, definable plan. This plan is developed around reducing rig time and eliminating lost motion. We refer to it as "massive elimination."

Generally, massive elimination covers every phase of drilling activity. Specifically, it aims at completely eliminating work which, in the ultimate analysis, actually need not be done. Then, the goal is reducing the time required to do the remainder of the work. The massive-elimination approach is much like time-and-motion study used elsewhere. In drilling, however, there is a difference—he who profits most from lower well costs is the one to assume a greater share of the burden of improving efficiency. That is the owner of the well.



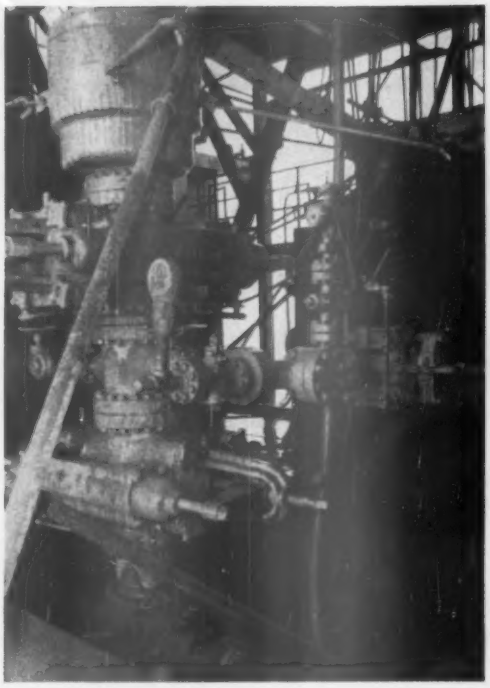
THE BIG PAYOFF for Gulf's "massive elimination" program came in the reductions of drilling time and well cost. Program got under way in earnest immediately after January 1960; since that time, costs have been cut steadily. Fig. 1.

Speed in itself is no reward. But, high speeds cut drilling cost.

Fig. 1 shows how costs have been cut in Timbalier Bay field. Beginning in 1957, average total well costs rose through 1959. Drilling time changed very little during the same period.

Near the beginning of 1960 the new approach, already proved in other fields, was applied at Timbalier Bay. By the end of the second quarter, average total rig time from surface to 10,000 ft. had decreased from 13.56 to 7.54 days. Over-all well costs declined 20% as speed increased. Improvement was constant beyond that point. At the end of the third quarter, drilling time was down to 5.4 days and costs had dropped 41% from the 1957 level and 50% from the 1959 costs.

With no exceptions, the Timbalier Bay performance has been duplicated in all fields where this ap-



BLOWOUT-PREVENTER STACK in place on time-saver wellhead on a Gulf well in Timbalier Bay. Installed on the conductor pipe before the well is spudded, the preventers were not removed again until the well reached casing point below 10,000 ft.

CONNECTION TIME was cut on this well from 4½ minutes down to about 1½ minutes. Gulf calculates that the 3-minute saving spread over an entire 10,000-ft. well could total up to almost an entire day. Later wells used range-3 drill pipe and reduced connection time even more.

drilling record in South Louisiana

. . . and here's how, as described by the man most directly responsible for making the fastest hole ever drilled. The speed records are no freak, he says, as they can be, and are being, duplicated

BY V. D. STONE

. . . area drilling foreman for Gulf Oil Corp. at Morgan City, La. A University of Oklahoma engineering graduate, he is the man most directly responsible for the startling drilling speeds set by contractors drilling for Gulf in that area. This paper was presented by Stone at the 1961 meeting of API Division of Production, Southern District, Shreveport, under the title, "High-Speed Drilling Techniques in Southern Louisiana."

proach has been fully applied. Where these methods have been partially applied, only proportionate results have been obtained.

Gulf's fast hole has created some problems, but these are almost insignificant compared to the problems eliminated and to the benefits gained.

The end of massive elimination has not yet been reached—ultimately, a well likely will be drilled to 10,000 ft. in 2 days.

Other good times. In just the past 3 years, several companies have drilled wells along the southern Louisiana coast remarkably fast. One operator is drilling and completing 9,000-ft. single wells near the mouth of the Mississippi River in about 7 days. Another drilled a well in Caillou Island field to 14,000 ft. in 14 days,[1] passing the 10,000-ft. level in 6 days. Many others obtain high drilling rates, especially in the loosely consolidated shallow formations in certain areas of the Gulf Coast. However, drilling to 10,000 ft. in 10 days or more is still most common in the vast majority of the coastal fields where formations are harder.

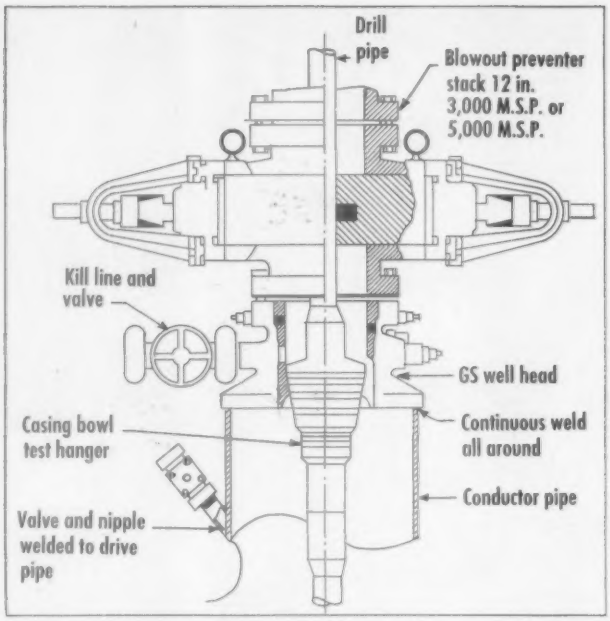
It is hard to determine accurately

all factors responsible for the higher speeds. There is a problem frequently even within individual companies. In many cases, well plans vary from job to job on each rig. This causes variations in drilling time. Moreover, there are a multitude of drilling problems within the region; this fact is a distracting influence in determining the efficiency of certain operations. Organizational complexities and weak reporting methods further hamper the assembly of the facts. The factors responsible for high speeds usually remain a mystery. As a result, most fast holes are explained with such comments as: "We had good luck," "good run due to no trouble," etc. These improved performances can be more accurately analyzed.

This paper analyzes some of the speed-influencing factors and shows how they can be controlled intentionally to increase speeds consistently. It includes offshore and inshore wells in several different fields. These speed records, like all others, are of only general interest unless they can be duplicated. The fact that Gulf's performance has been repeated and improved shows there is a new pattern for general use.

Wellhead. Time study of common drilling practices shows much labor and rig time is used to install wellhead equipment and blowout preventers. This work usually required 3 days on ordinary wells where high-pressure controls were necessary. Gulf has cut over 2½ days from this time without decreasing the effectiveness of the equipment.

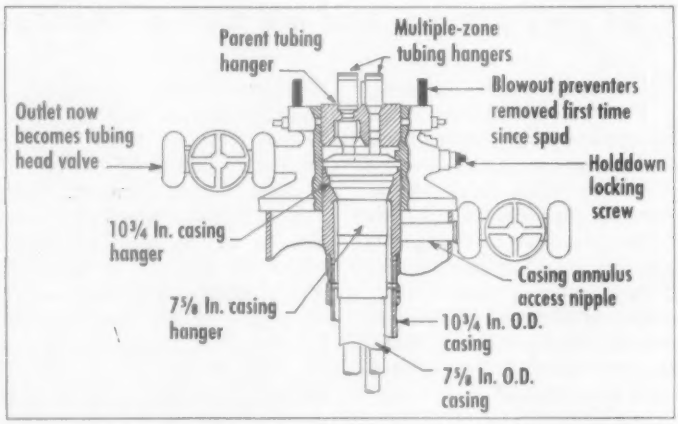
A new wellhead assembly was designed specifically to reduce rig time yet safely control high pressures; it was used on the fastest wells. This assembly saves time by avoiding the usual blowout-preventer removal and reinstallation following the setting of each string of casing. The preventers are installed only one time, before drilling commences. There is no subsequent spool installation or preventer removal until the tree is put on just prior to producing the well. Not only does the new head cut preventer-handling time by 80%, it also reduces preventer investment and maintenance expense. Moreover, it is safer in some ways than conventional equipment.


Drill pipe
Blowout preventer stack 12 in. 3,000 M.S.P. or 5,000 M.S.P.
Kill line and valve
GS well head
Casing bowl test hanger
Continuous weld all around
Conductor pipe
Valve and nipple welded to drive pipe

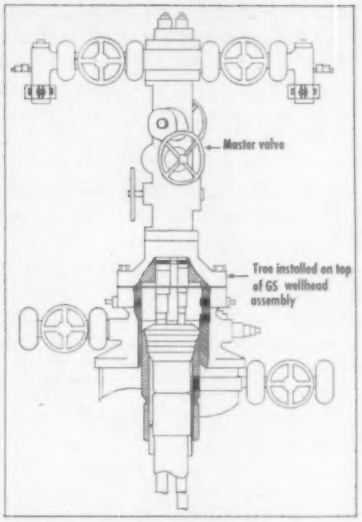
TIME-SAVER WELLHEAD, also called the Type GS. The body is welded to drive pipe and driven by a pile driver before the rig arrives on location. Blowout preventers are welded to studded flange at top. Preventers don't have have to be removed to run subsequent casing strings. Fig. 2.

Fig. 2 is a cross-section view of the assembly, called Type GS time-saver wellhead assembly. The head body is welded to drive pipe, driven by a pile driver, and blowout preventers are bolted to the studded flange at the top. This can be done prior to the rig's arrival. The preventers are tested with a conventional plug seated in the bottom bowl and, then, surface hole is drilled to required depth.

Fig. 3 shows the successive steps from initial drilling to completion. A string of 10¾-in. casing is run and landed in the bowl at the bottom of the head with a boll-weevil hanger on the last casing joint. The last casing joint in the preventers is then unscrewed. After again testing the preventers with a conventional test plug, drilling is resumed. Subsequent strings of casing and tubing are suspended in the head on boll-weevil hangers lowered through the preventers in a similar manner. All hangers are mechanically locked to the head. The preventers are re-


Parent tubing hanger
Multiple-zone tubing hangers
Blowout preventers removed first time since spud
Outlet now becomes tubing head valve
Holddown locking screw
10¾ In. casing hanger
Casing annulus access nipple
7⅝ In. casing hanger
10¾ In. O.D. casing
7⅝ In. O.D. casing

LANDING TWO STRINGS through the time-saver wellhead without removing preventers has cut time required to install this equipment from 3 days down to about ½ day. Preventers are removed one time—at the end of the completion when the tree is installed. Fig. 3.



TREE IN PLACE in time-saver wellhead. While this figure shows three tubing strings, principle is the same for single or dual completions. This wellhead has not only proved faster, it is also safer in several ways. Fig. 4.

moved one time, at the end of the completion when the tree is installed.

Fig. 4 shows the completed well. The tree is in place and ready for production.

It seems reasonable that further study of wellheads might reduce work and rig time even more.

Hydraulic programs. Hydraulic programs were carefully engineered on the high-speed wells.[2] At first, a minimum annular velocity of 120 ft. per minute was arbitrarily picked as a base for fluid calculations. Jet sizes were selected to give highest possible jet velocities with the hydraulic horsepower available on each rig. This usually gave jet velocities in the range of 350 to 450 ft. per second.

As bigger rigs with heavier pumps became available, it was possible to use the smallest jets (⅜-in.) which experience indicated would not likely become plugged with rubber or trash. These jets gave jet velocities of over 600 ft. per second with annular velocities above 200 ft. per minute. Pump pressures on the surface required to give this performance through 5-in. drill pipe ranged between 2,500 and 3,100 psi.

Rotary speed. Rotary speeds were high on the fastest wells. They varied between 180 and over 450 r.p.m., depending upon the equipment available on each rig. Perhaps, 250 to 350 r.p.m. was average. The highest rotary speeds cannot be reliably reported because of lack of accuracy in the rotary tachometers.

Throughout the high-speed runs it was clear that drilling rate increased with increasing rotary speed. These high rotary speeds were made possible through use of 600 to 1,000-hp. rotary drives, 5-in. o.d. drill pipe, and flexible power systems such as the electrical type.

Weight on bits. Relatively high bit weights (from 50,000 up to 100,000 lb.) were used in most of the fast drilling. The average ranged close to 70,000 lb. in 9⅞-in. holes.

While the higher weights increased the drilling rate, in many places the increase was not quite as much as from rotary speed. The maximum bit weight, therefore, frequently depended upon the corresponding decrease in rotary speed. Weights in the faster hole were seldom increased enough that the rotary slowed below 180 r.p.m.

Obviously, the maximum bit weight - rotary speed combination depended on the horsepower available to turn the rotary. Horsepower used was the maximum much of the time. It appears likely that the high weights were practical because good hydraulics kept the hole bottom clean.

Drill pipe failed twice, under the high torques imposed by use of heavy bit weight and high rotary speed. Both failures were in 4½-in. API X-hole tool joints on 4½-in. o.d. drill pipe. Rotary power in each case was applied through direct drives with almost no flexibility.

Drilling fluid. Drilling fluids were carefully controlled on the high-speed wells to avoid those properties known to decrease drilling rate. Weights were as low as safety permitted. In most cases this called for a minimum of approximately 10 lb. per gal. With some experience behind, we were able to pump clear bay water into the drill pipe. As long as the drilling rate stayed between 250 to 500 ft. per hour, enough formation solids were picked up to get a 10-lb. per gal. mud out at the surface.

This was ideal. Not only was hydrostatic head high enough, but also the fluid going down the pipe, out the jets, and around the bit was sand-free fluid with zero solids content, minimum friction loss, and maximum water loss. The clean fluid environment at the bit no doubt helped keep shale from balling the bit and kept the hole bottom free of cuttings so that the teeth could get maximum penetration. In evidence of this, the bits had a shiny, polished appearance when removed.

Beyond the point where barite and chemicals were added, similar fluid properties (higher-than-normal water loss, lower-than-normal solids content, and moderate specific gravity) were retained so far as practical to keep penetration rates high.

The drilling fluid not only raised rate of penetration but also reduced labor previously required to handle hundreds of sacks of chemicals, clays, and barites. This labor reduction was relatively small in itself, but when combined with many other small savings, resulted in a big total. The drilling crews concentrated their efforts on the most important task of making hole.

Average mud costs were reduced 75%.

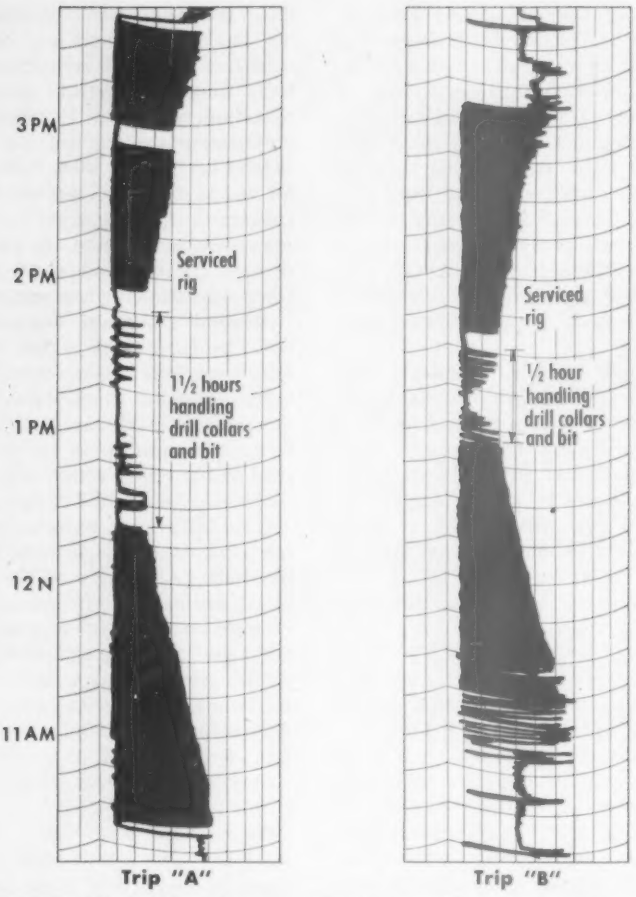
Using clear water as a drilling fluid probably contributed to two cases of stuck drill pipe. In four other wells, several hundred feet of hole had to be reamed or redrilled. All of this trouble was insignificant compared with benefits derived.

Time-Consuming Practices

All practices, motions, and maneuvers which required labor or consumed rig time were critically examined. Many time-consuming practices were either omitted or used in a more efficient way on the fastest wells.

Drill-pipe connections. Drill-pipe connection time became one of the first subjects of intensive study. The average driller used an excessive amount of time in each of the following motions:

1. Pulling the kelly out of the hole.
2. Pulling the new joint out of the mouse hole after making up the kelly.
3. Lowering the kelly back toward bottom near the end of the connection.
4. Stabbing kelly drive bushings into rotary-table master bushings.



WEIGHT ON HOOK as shown in time-strip recordings represents two different trips while changing bits handling eighteen 7½-in. drill collars. In trip A, 1½ hours was consumed. In trip B, handling procedures were improved so only ½ hour was needed. Fig. 5.

5. Getting the pump started late before reaching bottom to resume drilling.

The driller's crew frequently lost time by:

1. Delay until the drill pipe was completely stopped before setting the slips when pulling up to break off the kelly.

2. Delay while drilling fluid drained out of the kelly before pushing it over to the mouse hole.

3. Incomplete chain spinup of the kelly in the tool joint at the mouse hole because of misalignment of the mouse hole.

4. Slow tong installation resulting from slippery floors.

All these points were improved by the drilling crew through minor mechanical adjustments and a change in habits.

The following shows how drill-pipe connection time was saved on the average fast well.

4½-minute connection vs. 1½-minute connection = 3-minute loss.

10,000-ft. well ÷ 30-ft. joints = 333 connections.

333 connections × 3-minute loss on each = 999-minute loss.

999 min. ÷ 60 minutes per hour = 16⅔-hour loss.

It was possible to make connections in less than 1½ minutes; formerly, 4½ minutes was consumed. This amounts to an actual saving of 3 minutes per connection. Because there are normally 333 connections made on a 10,000-ft. well (3 × 333 = 999 minutes or 16.6 hours), almost 1 day was saved to that depth. In the latest fast holes, connection time has been reduced another 25% by using API range 3 drill pipe.

Trip time. The time to handle drill collars and change bits on trips became the subject of another study. We noticed that 1½ hours was normally consumed between the point where the first collar was pulled through the rotary and the point where the last collar had passed back through on the way in the hole. This time was reduced 66% (to ½ hour) by discontinuing the use of a drill-collar safety clamp and by rotating the collars with machinery instead of manual labor.

We made further improvements by changing to collars with built-in elevator shoulders, thus eliminating time and labor consumed in handling lift plugs.

Fig. 5 shows two time-strip recordings of weights on the hook while making round trips on different occasions. In both cases 18 drill collars, size 7½-in. o.d. were handled by the same efficient crew on the same powerful rig. On trip A, 1½ hours was consumed in changing drill collars and bit as indicated. This occurred prior to elimination of extra work. On trip B, only ½ hour was consumed after elimination of the extra work. Trip B was also easier for the crew.

Slope tests. Slope tests were another source of wasted rig time. In certain sections of some fields they were eliminated entirely. In other sections they were reduced from one each 250 ft. to about one on each bit. The drillers were instructed to assume the hole to be straight and to apply bit weights accordingly. Directional logs were run on these wells prior to setting casing.

This essentially eliminated the practice of fanning bottom to straighten a 3° "crooked" hole. We made some exceptions, taking numerous slope tests in fields where it was found necessary.

In most cases the holes have suffered very little excessive deviations from vertical. The vast majority of those which did build higher than normal angles drifted back to practical limits. This policy on slope tests was used on the fastest wells.

It is interesting that on roughly 75 wells using revised slope-test practice, only 4 became highly deviated before we discovered this fact with a photoclinometer survey. Two gave additional geological information but were plugged back and a portion redrilled. Both resulted in dry holes in the crooked, as well as the redrilled vertical sections. The other two resulted in major, unex-

SHINY APPEARANCE of bit after drilling more than 3,000 ft. is testimony to the way that rig hydraulics are keeping bottom of hole cleared of cuttings. Result is that Gulf-directed rigs can now reach 10,000 ft. using only five bits below surface casing.

SURFACE CASING comes aboard a Gulf location in Timbalier Bay. Company formerly set conductor string below its drive pipe and above the surface pipe. Eliminating this string saved time and money as well. There has been no trouble as a result.

pected geological discoveries. One was plugged back and the other retained as a directional triple producer.

A new automatic drift indicator[3] recently developed by an equipment manufacturer is proving to be an aid where this approach is used.

Circulating and conditioning mud. Circulating time before trips, after trips, prior to setting shallow casing strings, and upon penetrating breaks in shallow formations was found to be either unnecessary or excessively used in most cases. Although we did not entirely prohibit these practices, we drastically curtailed them in all except extraordinary situations and almost eliminated them on the fastest wells. The proper control of this practice has saved much rig time with no adverse consequence.

All mud conditioning and treating was done while making hole. This called for revised planning, greater skill, and more over-all knowledge by the drilling-fluid engineer. Treatment was applied to eliminate approaching problems rather than current problems.

Reaming. The practice of back-reaming or drilling each joint down at least twice is fairly common with many drillers on the Gulf Coast. This practice was arbitrarily eliminated on the fastest wells. The technique possibly began on unusually troublesome holes or perhaps in those wells drilled with sandy-high solids mud where hole diameter tends to decrease above the bit. Regardless of the previous reasons for back-reaming, the practice now appears to be of questionable value in most routine southern Louisiana wells when all other techniques are properly controlled.

In most fields, we stopped the practice of drilling an undersize surface hole, laying down drill pipe, then reaming the hole to desired size. Instead, we drilled surface holes of all sizes with a full-gage string reamer 60 ft. above the bit.

Waiting on cement. Waiting-on-cement time was almost eliminated, by comparison with normal practice. The small amount of wellhead control work comemnced immediately following the cement jobs and concluded before the cement became hard. During the remaining time required for the cement to set, the bit was changed, additional drill collars picked up, and the new drilling assembly lowered back into the hole. After a brief waiting period to comply with cement-setting-time rules, drilling resumed. Thus, waiting time was productive.

Waiting on orders. Waiting on orders was eliminated on the fastest wells. This was made possible by:

1. Increased rig supervisor's authority.
2. Approved alternate plans.
3. Direct contact with line supervisors and technical advisors over radio-telephone communication systems.

Measuring drill pipe. We found it practical to eliminate the practice of measuring the drill pipe on certain rigs. In those cases the drill-pipe joints were reasonably uniform in length. The joint lengths were averaged and the driller determined depth by merely counting joints. This saved labor, reduced rig time, and made operation easier on the fastest wells.

We might give further consideration to this practice when we buy drill pipe.

Electric logging. Logging time

was cut to a minimum on the fastest wells. In most cases the openhole electric logs consisted of one electric survey, one directional survey, and one or two sidewall core gun runs. Among those eliminated were:

1. Electric surveys in the surface hole.
2. Intermediate electric surveys prior to reaching total depth of next hole below surface casing.
3. Temperature surveys.
4. All kinds of special electric logs.

Materials

We were able to cut our material requirements on the fastest wells. Although our intent was to reduce labor and rig time, we also saved in purchase cost as well. We noticed that most always when we reduced material we eliminated a certain amount of rig time. Many other actions which reduced rig time conversely eliminated materials.

Casing. Conductor casing, usually 16-in. o.d. or larger, was formerly set below the drive pipe. However, the conductor string was eliminated from the well plan. Instead of setting this pipe as a matter of habit, it was planned to use the material only if needed. Only on very rare occasions did such a need become evident. This practice saved from 300 to 600 ft. of casing and about 24 hours of rig time on many wells.

Also important is the fact that the elimination of conductor casing combined with the use of the new wellhead assembly eliminated a possible blowout hazard. The wells were not uncapped for a blowout-preventer installation on the conductor pipe or surface casing. To this extent, the new approach seemed safer. The practice of setting conductor pipe below the drive pipe, therefore, was confined to places where the need had been proved.

We examined critically the quantity of surface casing proposed for each well. In most cases a little less was set than previously. For example, 2,000 ft. was used in several 10,000-ft. wells instead of 2,500 ft. In addition, the supervisor on the rig was given authority to reduce the setting depth of surface pipe by as much as 300 ft. in the event drilling became hard. This approach proved more realistic than the previous practice of establishing an inflexible depth based primarly on the fact that it was deeper than necessary.

Casing sizes were selected in accordance with their predicted effect on drilling speed. In most cases, 10¾-in. o.d. surface pipe was set in 15-in. hole. A 9⅞-in. hole was drilled below the surface pipe. This combination proved faster than smaller and larger casing programs.

Bits. The drilling fluid and the bit weight-rotary speed combinations reduced the average number of bits used to 10,000 ft. from over 10 to 6. This, of course, saved four round trips to change bits. We saved an average of one bit more by arbitrarily leaving the bit in the hole longer. The net saving amounted to approximately 24 hours of rig time and materials valued at $1,365.

Only shale bits with the longest teeth were used.

Floating equipment. We eliminated the float collar commonly used in conjunction with the float shoe on the next-to-bottom joint of surface casing. Purpose was twofold: to shorten time required to drill about 30 ft. of cement left by the cement job between the float shoe and float collar; and to extend the life of the bit used to drill the plug.

We shortened time even more with rubber-covered cement wiper plugs with plastic cores replacing the aluminum cores previously used. Those with plastic cores were more drillable.

By these changes in floating equipment we reduced the plug-drillout time to less than 20 minutes from the previous time of 1 to 2 hours. Also, the life of the first 9⅞-in. bit was extended some 500 ft. We have used these practices in more than 100 successive wells. There have been no known adverse effects; there is no apparent difference in the cement jobs around the shoes. Surprisingly, the bottom casing joint has not unscrewed in any of these wells.

Centralizers and scratchers. Centralizers and scratchers were eliminated. Purpose was to save labor and supervision consumed in installation, plus the cost. This elimination apparently has produced no adverse effects.

Well-Completion Time

We can consider completion practices and rig time consumed therewith because they have an effect on ensuing drilling speed. We found that anything which broke the pace and decreased the speed of a fast rig tended to handicap later efforts to regain peak efficiency. In view of this fact, every effort was made to complete wells drilled by the fastest rigs as simply and quickly as possible. On offshore jobs and others in remote locations where the rigs which drilled the wells had to do the completion work, the following practices were either eliminated or drastically curtailed.

1. Drill-stem tests.
2. Special completion fluids.
3. Lengthy well tests.
4. Extra trips with bit or casing scraper.
5. Use of small-diameter wire lines to close sliding sleeves or other related downhole equipment.
6. Production packers which require extra rig time to set.
7. Extra miscellaneous equipment in tubing strings.

Most of the fastest inshore rigs were used only to drill the wells and set casing. They were moved without delay to the next drilling location. A much smaller workover rig was used on the completions. This kept the drilling rigs operating at high speed on work which they could perform best. Result was cheaper wells due to the lower cost of the smaller rigs.

Equipment and Methods

The rigs used on the fastest wells were the most powerful, modern, and newest equipment which could be obtained. This was the case on offshore as well as inshore work. The horsepower ratings varied from 2,500 to 4,000 hp. Each was equipped with at least one 1,000-hp. pump and all had pumping systems which could receive a power input of between 2,000 and 3,200 hp. The power supply was balanced so that all of the pump's hydraulic capacity could be used.

It was evident that the rigs used on the fastest holes had been assembled by exceptionally competent drilling contractors who had a keen

desire for speed and efficiency. The derrick floors were all roomy, free of unnecessary objects, and essentially flat or free of major changes in level near the rotary table. Mouse holes were close to the rotary table and readily adjustable below the floor for proper alignment with the kelly.

All rigs (except one) were less than 5 years old and of latest design. The oldest rig apparently was quite advanced when built and had been modernized with larger equipment. We considered these, as well as other related factors, when we selected equipment.

Personnel. The men who drilled the fastest wells were quite competent and took great pride in their accomplishments. The drilling crew was composed of the customary complement working the usual schedules. For example, there were three crews of six men each working 8 hours a day for 7 days each week on inshore jobs. On offshore jobs, two crews of six men each were aboard most rigs at all times. They worked 12 hours per day for 7 days, then had 7 days off duty. The offshore jobs also had the usual complement of roustabouts, cooks, electricians, and welders.

The supervisory team was a group of three to four men who were not on the job merely to keep the crews working hard. That was not necessary. These men functioned primarily to improve the efficiency of the entire operation.

The supervisors not only put to use the latest techniques, but they also sought to extend these techniques toward unknown maximum limits. Knowing that high rotary speed increased drilling rate, for example, they attempted to find out how fast the drill pipe could be turned without detrimental effects. They kept close check on all related things such as loads on rotary motors, drill-pipe wear, and hole conditions. A similar approach was made in use of increased weight on the bits, high-water-loss drilling fluids, extreme hydraulics, and others.

The supervisors made job-level plans and organized action for approaching phases of the work. They coordinated procurement and work of service companies (a big job in high-speed work), directed mud treatment, and kept accurate records. They rendered very valuable assistance in the study and development of new ways to eliminate work on future activity. Finally, these men exercised normal supervisory control of the entire operation. This action by the supervisors further relieved the drilling crew of burdens. The crew directed its undivided attention to the hole and speed of drilling.

It is significant that three to four supervisors were on the job at practically all times. There were no exceptions during the initial acceleration period. These men were given scheduled off-duty time. This means that the usual supervisory effort was more than doubled. More competent supervisors were required. Basically, they performed a new task though they retained the customary titles of contract tool pusher, company drilling foreman and drilling engineer, and service-company mud engineer.

The number was decreased by one in some cases after reaching peak efficiency.

The rig supervisors maintained close contact with higher supervisory and technical staffs at the offices of the drilling contractor, mud company, and the operator. This was accomplished not only through the radios but also through frequent personal consultations at the rigs.

Drilling program. The drilling contractor and the crews were advised at the beginning that outstanding performances accompanied by exceptionally good results probably would be rewarded with continuous work. This helped dispel fears of frequent layoffs resulting from short, fast jobs. It also gave a strong incentive for the contractor to equip his rig for high-speed operation. In a sense, this provided a highly coveted prize and a special goal. It also stimulated competition among rigs in the same field.

The fastest rigs were awarded continuous work extending through many months, and on into years for some. In most cases no down time occurred at all, even between wells. New locations were prepared in advance. The quickest rig moves on record were organized. High employe morale and keen interest in the work developed throughout the entire organization of all companies involved. Even higher efficiency was achieved. Each new well became a new challenge for greater speed. Time and well costs decreased.

Plan of procedure. Work on each well progressed in accordance with a written, general plan. These plans were frequently developed jointly by the drilling contractors, mud-company technicians, and the operators' representatives. Then, the final plan was duplicated and distributed to everyone concerned. It outlined casing program, mud program, drilling techniques to be used, statistics on nearby wells, and other useful information of a general nature.

As a supplement to the drilling plan, we prepared a proposed time schedule in much detail for the fastest wells. This schedule allocated a certain number of minutes or hours to each phase of the operation. By comparing actual time consumed with the proposed schedule, the job supervisors detected and reduced excesses at the moment they occurred.

Summary of action. The approach, plans, and methods used on the high-speed wells could be summarized in large part as a consolidated, precise application of known techniques. Most of the latest theories on rotary speeds, weight on bit, and drilling fluids were applied in full measure, frequently beyond suggested limits.

The plan used in fast drilling did not prove to be a means of eliminating all problems. On the contrary, it created some. But many other problems frequently encountered in much slower drilling apparently were eliminated. For example, no casing strings were stuck and there was a decrease in fishing jobs. There certainly were no problems which could be attributed to slow speed. Regardless of the cause, no one problem was viewed as a valid reason for generally decreasing the speed of drilling. Solutions were sought in other areas.

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THIS LINE in Pakistan was exposed for 3,500 ft., the ditch dug to depth, and piers left every 30 ft. as support for the line. Fig. 1.

WORK was done by workmen by hand without mechanical aids. Fig. 2.

How to lower a line . . . by hand

THE UNUSUAL FEAT of lowering a 16-in. gas pipeline 14 ft. with no mechanical aids and without interruption of service has been performed by Sui Gas Transmission Co. It was called upon to do the job when the Pakistan Government decided to build a canal, 300 ft. wide and 10 ft. deep, in the area traversed by the line.

The 347-mile pipeline carries gas from Sui field to Karachi and Hyderabad. It was completed in 1955. In 1960 the government began the construction of the canal to irrigate the area west of the pipeline. The canal route crosses the line 13½ miles south of Sui field.

The line was laid originally at a depth of 5 ft. for the first 80 miles from the field. Since the canal was to be 10 ft. deep, it was necessary to drop the line well below that depth for adequate protection. It was decided to lower it 14 ft. at the crossing with a gradual slope of about 1,500 ft. to the normal depth on either side.

Before the job was started, a level survey was run on the line even though it appeared that the desert in the area was generally flat. Its purpose was to locate high or low points that could be taken advantage of in the lowering. Results were highly successful. It made it possible to plan the work so that no stress was brought to bear on the line at any time.

The line was exposed for a distance of 3,500 ft. and the ditch dug out to the required depth. Earth piers were left every 30 ft. to support the pipe (Fig. 1). It was lowered 6 in. at a time over a 100-ft. stretch.

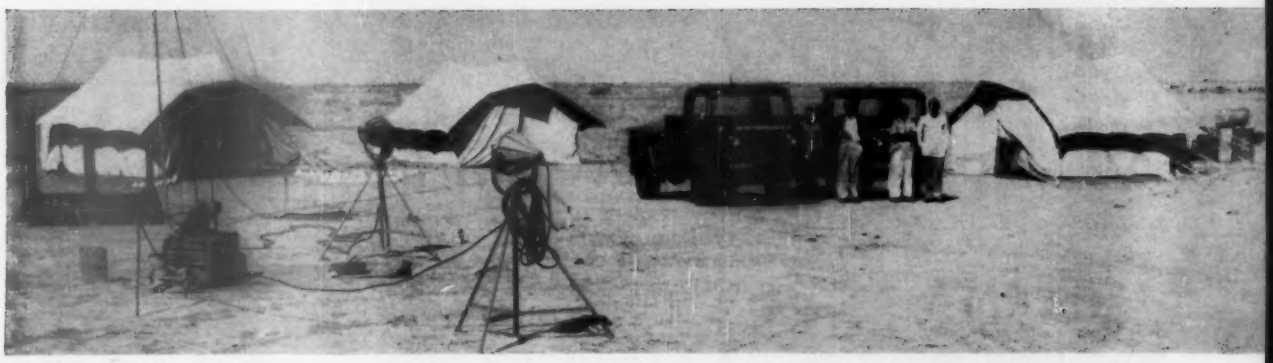
All the excavation work was done by local Pakistan workmen using only hand tools. It is estimated that they excavated about 800,000 cu. ft. of earth. No mechanical means of earth removal were used at all (Fig. 2).

Camps were set up for the workmen so that they could remain on the site (Fig. 3). Water for personnel and construction purposes had to be transported over an area of shifting sand dunes for 13 miles. Mobile radios and battery-operated loudspeakers were used for communication.

The area is subject to wide temperature fluctuations, from above 100° F. in the day to 50°-60° F. at night. It is also an area of infrequent but sometimes torrential rainfall. In order to counter the effect of possible rainfall and the consequent floating of the line and washback of earth, the line was weighted with sandbags as it was exposed.

Despite adverse conditions and primitive methods, the job was completed in 16 days. There was no interruption because of rain but 2 days were lost because of strong winds and heavy dust storms.

Level gages were installed every 30 ft. and stress gages every 40 ft., to maintain exact control of the lowering operation. The stress gages, a very simple device, were attached



PARTIAL VIEW OF THE CONSTRUCTION CAMP. Temperature fluctuations of 50° F. and sand storms hampered work. Fig. 3.

to the bottom and top of the pipe. They made possible very close stress control throughout. Records were made continuously and were referred to constantly (Fig. 4).

These gages consisted of ⅜-in. bars, 14 in. in length (Fig. 4). They were tack-welded at both ends to the pipeline and cut through at the middle. The gap was checked with an ordinary feeler gage. Readings indicated whether the pipe was being subjected to longitudinal stress or compression.

One short-lived problem was encountered with the stress gages before the lowering began. They were checked daily at 8 a.m., noon, and 5 p.m. There was a consistent difference in the noon reading. It indicated that the line was then under a compressive stress.

It was found that the gage, only lightly tack-welded to the line, was at a higher temperature than the pipe. Movement of the gas in the line kept the pipe-wall temperature at a somewhat lower level than the ambient temperature. The heat of the sun, therefore, caused greater expansion of the gage than the line.

This was compensated for in readings during the lowering operation. Accuracy of the gages proved out during the lowering. Those on top of the line reflected compressive stress at the same time those on the bottom indicated tensile stress.

CONTINUOUS RECORDS were made of stress readings. Constant reference kept line from undue stress. Fig. 4.

Another indication of the accuracy and value of the gages occurred when it was found that, on some occasions, both top and bottom gages indicated the same type of stress. This resulted from uneven lowering and when the piers were adjusted to correct the unevenness, both gages yielded normal readings. Maximum elongation indicated by the stress gages was 0.007 in.

Slight field bends that had been made in the pipe when it was laid originally were maintained. These bends were stress-gaged at the beginning of the work and after it was completed. It was found that the stress was the same afterward as it had been before.

The Sui-Karachi line has a design capacity of 123 M.M.c.f. It is being operated at approximately 48 M.M.c.f., with 33 million going to Karachi and 15 million to Hyderabad. The takeoff pressure is 1,070 psi. Since the industries dependent on the gas could not operate without it, it was not desirable to interrupt the flow.

Since the flow could not be interrupted, consideration of cutting it and bridging the canal had to be abandoned. There was the additional risk that the line would be damaged during construction of the canal. The only change was to drop the pressure to 700 psi. and maintain it there during the lowering.

The canal crossing is protected by walls on either side of the line and by a slab covering from wall to wall. The crossing is at a curve in the canal. Since experience showed that the curve would produce a scouring action, a retaining wall was built downstream of the line. It will retain the earth in the canal bed in the immediate area of the pipeline.

34. How to estimate oil in place

in a solution gas drive by material balance below bubble point

BY E. T. GUERRERO

GIVEN: Pressure, production, and fluid-analysis data for Reservoir A as shown in Table 1.

Reservoir data were taken after a decline to the bubble-point pressure of 1,800 psia. There has been negligible water production. Reservoir temperature is 98° F.

FIND: Original oil in place in the reservoir using the material-balance equation and the data at times 1, 2, and 3 (Table 1).

METHOD OF SOLUTION:

The basic material-balance equation states that the cumulative fluid withdrawals from a reservoir to any time equal the change in volume of the fluids initially present plus the inflow of any fluids into the reservoir.

Solving this for the initial oil in place, N, the complete form applicable to all types of reservoirs is:

$$N = \frac{N_p B_o + N_p B_g (R_p - R_s) + W_p - W_e}{(B_o - B_{oi}) + (R_{si} - R_s) B_g + m B_{oi} [(B_g/B_{gi}) - 1]} \quad (1)$$

Where:

Z, p_b, p_i, N_{pb}, p, N_p, R_p, W_p, B_o, R_s, p_a were defined with the data and

N = initial oil in place, st.-tk. bbl.

B_g = gas formation-volume factor, res. bbl./s.c.f.

W_e = cumulative water influx, bbl.

B_{oi} = oil formation-volume factor at initial reservoir conditions.

R_{si} = solution gas-oil ratio at initial reservoir conditions, s.c.f./st.-tk. bbl.

B_{gi} = gas formation-volume factor at initial reservoir conditions, res. bbl./s.c.f.

m = ratio of initial reservoir pore volume occupied by free gas to that occupied by oil.

i = subscript referring to initial reservoir conditions.

b = subscript referring to bubble-point reservoir conditions.

T_f = reservoir temperature in °R.

If there is no initial gas cap, the last term in the denominator is zero and may be dropped. Since there is uncertainty as to whether fluid influx into the reservoir exists, let it be assumed that the water influx is zero for the time being.

With these simplifications, the material balance for a closed reservoir, using the bubble point for initial conditions becomes:

$$N' = \frac{N_p [B_o + B_g (R_p - R_s)] + W_p}{(B_o - B_{ob}) + (R_{sb} - R_s) B_g}$$

= st.-tk. bbl. oil in place at bubble point reservoir conditions (2)

and

$$N = N' + N_{pb} \quad (3)$$

To solve the problem given, substitute the applicable data for time "1" in the above equation and solve for N'. Similarly, solve for N' using the data for time 2, and then for time 3. If the data are reasonably accurate, and the reservoir is truly closed, the three values of N' should be in fairly close agreement.

Sample calculations of N' from data at time "1"

1. First compute B_g at time "1"

$$B_g = \frac{p_a}{p} \times \frac{T_f}{520} \times \frac{Z}{5.615}$$

$$B_g = \frac{14.7}{1,482} \times \frac{558}{520} \times \frac{0.625}{5.615}$$

$$= 0.00119$$

2. Substitute in the material balance. Because it is desired to have the answer in barrels, it will be necessary to express all volumes in barrels.

TABLE 1—PRESSURE, PRODUCTION, AND FLUID-ANALYSIS DATA FOR RESERVOIR "A"

(1) Time	(2) p Weighed avg. res. pres., psia.	(3) N_p Cum. oil prod. thous. st.-tk. bbl.	(4) R_p Cum. GOR s.c.f. per st.-tk. bbl.	(5) W_p Cum. water prod. bbl.	(6) B_o Oil res. vol. factor, bbl. res. oil/ bbl. st.-tk. oil	(7) R_s Gas in solution s.c.f. per st.-tk. bbl.	(8) Z Gas compressibility factor	(9) B_g Computed gas formation vol. factor, res. bbl./s.c.f.
0	1,800 = p_b	0	...	...	1.268	577	0.621	0.00097
1	1,482	2,223	634	0	1.233	491	0.625	0.00119
2	1,367	2,981	707	0	1.220	460	0.631	0.00130
3	1,053	5,787	1,034	0	1.186	375	0.656	0.00175

p_i = initial reservoir pressure = 2,500 psia.
N_{pb} = st.-tk. bbl. oil produced above bubble point = 440,000.
p_b = bubble-point pressure = 1,800 psia.
p_a = atmospheric pressure = 14.7 psia.

$$N' = \frac{2{,}223{,}000\,[1.233 + 0.00119\,(634 - 491)] + 0}{(1.233 - 1.268) + (577 - 491)\,0.00119}$$

N' = 46.3 million barrels, stock-tank oil in place at the bubble point.

SOLUTION: From data for times 1, 2, and 3, the stock-tank oil in place at the bubble point is computed as 46.3, 44.1, and 49.9 million barrels respectively. The average for N' is thus 46.8×10^6 bbl. and

$$N = 46{,}800{,}000 + 440{,}000$$
$$= 47{,}240{,}000 \text{ bbl.}$$

DISCUSSION: The material-balance equation as used assumes that the following conditions hold:[1,2]

1. Reservoir volume is constant. This assumption is justified if the reservoir pressure is below the bubble point since the expansibility of the rock and water is negligible compared to that of gas evolved from solution. However, above the bubble point the equation must be modified to take into account rock and connate-water compressibility or serious error may occur in the results.

2. Pressure is uniform throughout the reservoir at any time. This is necessary to apply average fluid properties. If gas is at different pressures in various portions of the reservoir, serious error can result.

3. Laboratory PVT data obtained from analysis of bottom-hole samples are applicable. Actually the method of running the analysis does not exactly simulate reservoir pressure and volume behavior. Errors introduced here are generally minor.

4. There is no geostatic compression. This condition is satisfied by all consolidated formations.

5. The reservoir is continuous and uniform and the fluid withdrawals are uniformly distributed throughout. Although few reservoirs are uniform, reasonable results are obtained using average conditions for a pool.

6. Production data are reliable. Usually reported oil production is satisfactory. But gas-production data may be in error. Particularly this may be true where high gas-oil ratios cause penalized oil allowables. Where gas is metered and sold the data are more reliable. But even in these cases some of the gas produced is vented, flared, or used on the lease. In addition, a large fraction of the solution gas is usually separated (flash-type separation) at some pressure and temperature other than standard conditions. Thus corrections for separator conditions are important in determining the cumulative free gas produced, $N_p\,(R_p - R_s)$, particularly in the early life of the reservoir when solution gas is a sizable fraction of the gas produced.

Water production data are usually not accurate either. But this error may be unimportant if the water produced is only a few per cent of the total production. However, in a new field, it is not always safe to disregard water production as is frequently done in supposedly volumetric reservoirs.

In Equation 3 N' is a constant. For a reservoir that is closed (no migration in or out) that satisfies the assumptions for use of the material balance equation and for which reliable data are available, the solution for N' using data for different times should agree within a few per cent and tend to be constant, as in this problem.

If there is fluid migration into the reservoir area, then the solutions for N' with time should give increasing values, none of which is the true figure for oil in place at the bubble point. This incoming fluid may be water from an adjoining aquifer, gas from an adjoining gas cap, or even oil from an unknown undeveloped area.

In most cases it is advisable to check the value of N found by material balance. This may be done by the pore-volume method.

In low-permeability reservoirs, it is usually difficult to determine a representative weighted average pressure for it is possible to have substantial pressure variations even in a closed reservoir. Another difficult case is a reservoir which is developed slowly such that the productive area is progressively larger during the critical first few years when drilling is performed and when the value of oil in place is most needed.

Once the ultimate productive area is determined, we must correct each previous pressure survey using an isobaric map of the entire reservoir to get volumetrically weighted average pressures for revision of previous estimates of original oil in place. Here again this is more important in the less-permeable reservoirs.

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Annual Refining Report:

The Journal Probes Modern Refining

NEXT WEEK, The Oil and Gas Journal brings you its annual refining report—the industry's most outstanding single refining report of the year.

This extraordinary issue will include:

- A 48-page 2-color section giving full descriptions and flow charts on selective modern refining processes.
- An expert analysis on the current refining situation, based on the industry's most current and comprehensive set of statistics.
- A 22-page plant-by-plant survey of U. S. and Canadian refineries, showing crude-charge capacity, process capacities, types of processes, and state and province totals for each process.
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Next week. April 3. Don't miss it!

Dr. Marschner is assistant director of information and communications at the Whiting research laboratories. J. O. Howe is technical associate at the Whiting laboratories and chairman of American Oil's publications committee.

ROBERT F. MARSCHNER J. O. HOWE

Research and Development Department
American Oil Co.,
Whiting, Ind.

These authors tell

How to train people to write better reports

A staff of technically trained writers is helping engineers and scientists at American Oil Co. to write better reports. Here are the results of their experience.

TWO APPROACHES might be used to improve the written communications of a staff of scientists and engineers.

One is to assign all writing tasks to people who, either by ability or by training, do a better-than-average job—a direct and costly approach that is often adopted when technical work is translated into instructions that must be understood by laymen.

The other is to provide on-the-job training—an approach that seems preferable when most of the writing must be done at the professional level. Large organizations could profitably use both approaches.

On-the-job training in writing has the bigger payoff in the long run. Never will professional people have any less to explain than they do now. Knowledge and know-how are their province; inability to explain them is a weakness to be corrected, not a blemish to be covered. Setting the right words in the right sequence in the minds of others who can use them requires hard thinking. No amount of routine writing by others can replace it.

Unless the need for better-written communication is recognized and endorsed by management, on-the-job training cannot function well. Scientists and engineers are impatient to get on with their jobs. Many believe that good writing is a marginal skill and some resist the very idea that there is room for improvement. Management needs to emphasize that reporting is part of the job. It must show how important good reporting is to the company, the man, and the profession. And it would do well to be sure what it actually wants in written communication.

A good way to endorse better-written reporting is to provide talks to the staff on the subject. They might be given by a consultant, an astute university professor, or by one of the staff who has the necessary interest and experience. Particularly effective in illustrating such talks are examples—bad and good—taken from past writing efforts of those being talked to. Although fundamentals need to be stressed, the subject must be faced from the standpoint of the scientist and engineer, rather than that of the English teacher.

Because the effects soon wear off, talks to the staff are but a first move. Reminders and followups keep the subject alive.

Such a reminder might be a one-page memorandum, distributed at frequent intervals, which includes analyses of critical writing problems, adaptations of key principles of writing to local needs, and summary articles on specific aspects of writing.

A good followup is a program of conferences between individual members of the staff and writing experts. Analysis of the writing of individuals usually reveals some characteristics that warrant greater use and others that should be avoided.

But occasional attention is not enough to insure high-quality reporting. There is always something to be done: changing needs must be analyzed, new problems isolated, and cures designed and tried. Moreover, help is needed most while the scientist or engineer is writing a report, however much he may learn beforehand or afterwards. Only constant attention suffices, whether concerned with internal reporting or outside publication.

Improving internal reports:

"Internal reports in most research and development organizations are of two distinct kinds: chronological and topical."

Chronological reports are administrative documents prepared at some calendar interval, usually by individual supervisors with the help of the men reporting to them: they typically repose in files, where they are arranged in order of date.

Topical reports are technological documents usually prepared by nonsupervisory men. They usually are found in the library, where they are catalogd by subject.

Despite the many obvious points of difference, chronological and topical reports are often confused, and trouble almost always results when they are.

Chronological reports differ from one organization to another. The pattern is often dictated — sometimes arbitrarily. Writing and reading habits—good or bad—of experienced supervisors are hard to change. Fortunately, once the local pattern is grasped, chronological reports almost write themselves.

Topical reports are—or should be—nearly alike everywhere. Upon them depends scientific and technological progress. They range from transient coverage of incomplete studies to permanent documents containing extensive data. Leaving the writing of transient memoranda exclusively in the hands of individual professional men may be advisable to permit evaluating their writing and thinking abilities. The bigger job of writing permanent research and development reports,

however, benefits far more from trained help than it suffers from loss of individuality.

Three sound principles for permanent reports are: Keep the pattern simple, give those responsible for the work full credit, and provide help when it is needed. For several years we have been providing assistance by technically trained writing experts for authors who wished to make use of this service. Almost the only requirement is that the manuscript be typed before review.

Organization turns out to be the biggest weakness of permanent reports. It is a serious one, for reorganization may call for extensive rewriting.

The cure lies in outlining all the way down to each paragraph, preferably using the key thoughts or words of the successive topic sentences as the outline. Some standard pattern—provided it is rational—will satisfy most readers and has the advantage that thoughts and data are easily plugged in. The biggest job of the writing expert may be to get across to the author how better arrangement can increase understandability, avoid repetition, and save page space and reading time.

Inadequate orientation is a smaller but tougher problem than weak organization. Seldom is a subject as complicated as the report makes it.

To simplify it, the author must provide less-informed readers with enough steering words to guide them through the report, while not dwelling on the commonplace to the resentment of the more-informed. There can be no pattern to follow, for each report has its own needs. The only cure is for the author to get help from a typical less-informed reader, and a technically trained writing expert comes mighty close. A dozen words in just the right places can convert an obscure report to a lucid one.

Once problems of organization and orientation are solved, other difficulties are not hard to cure.

Overqualification is a common one. Use of so many words that simple meanings are hidden is almost as bad. The tendency to provide too much detail of too little significance is familiar. Such conventional shortcomings as ridiculous sentence structure, piled-up adjectives, ill-chosen words, and incorrect punctuation are "easy pickings" for a qualified writing expert.

Preparing better publications

"As might be expected, organization is the biggest problem in publications, as it is in internal reports."

In the sciences, published articles represent a large fraction of writing effort. Concepts and knowledge expressed by individual authors in professional journals are essential to the advancement of science. In engineering, on the other hand, success and satisfaction tend to be measured in structures and equipment and products.

But even in the most-applied fields, the quality of research and development effort tends to be judged from publications—or lack of them. Because of the permanent nature and broad readership of published documents, extraordinary attention to preparing them is warranted.

Almost any management, before it allows proprietary information to benefit outsiders, requires some kind of review. Management must guard patentable ideas, and it rightly wants to know what its scientists and engineers are putting into print. But

seldom has management thought about the eventual value of the document to science and engineering, or the ability of authors to handle such valuable material. Ten years ago, our company took steps to improve its publication practices.

In our company, a publications committee is assigned the task of helping authors do a better job of communicating with their professional counterparts elsewhere. Its five members include a permanent chairman and secretary plus three rotating members selected from supervisors in various areas of research and development.

All manuscripts designed for publication must first undergo review by the committee. It learned early that, to be effective, it had to sit down with authors for as long as needed to resolve its questions and their problems. Six-hour sessions are frequent with manuscripts only 10 pages long, and some of them have to be reviewed again.

Even when the manuscript is derived from an earlier report, both organization and orientation may need attention, for the scope is almost invariably broader or narrower.

An understandable fault is the tendency of authors to include inconsequential aspects of the work simply because they were done, rather than because they contributed significantly to the solution of the problem.

Out of this background have developed three cliches that the committee often finds occasion to repeat: Write for the reader; stick to the story; say it once and say it well. These principles apply as well to any other form of written communication as to articles for publication.

Studies of professional journals indicate that most published papers are no better than manuscripts submitted to our committee.

The typical paper in the chemical literature, for example, can be cut one-third without loss of a single concept or contribution. Moreover, when papers are so improved, they become enough clearer that about one in four can be seen to contain too little new material to warrant publication at all. The bulk of the chemical literature could thus be cut in half without loss. Such experience as the committee has had with engineering literature suggests that at least an equal reduction could be made there.

A publications committee probably cannot pay off on the basis of better publications alone. But, as a medium for promoting clearer writing—and the clearer thinking that results—it is unusually effective. Members of the committee and authors who appear before it benefit alike.

Gradually the payoff emerges in better writing in internal reports and thinking in the conduct of research. The committee pattern might profitably be adopted by many groups of scientists and engineers.

In summary:

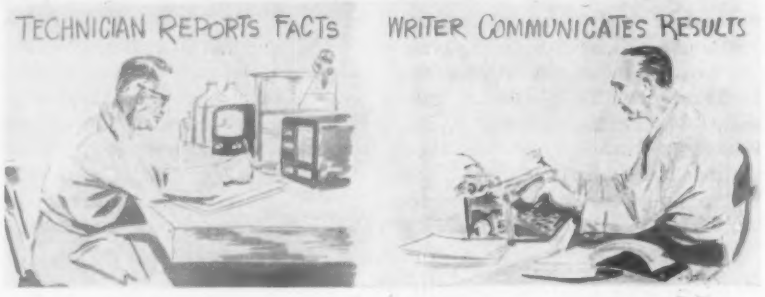
"More and more of our scientists and engineers recognize that written communication presents a challenging problem and seek to solve it."

Our attempts at American Oil to improve written communication have required the efforts of less than one man per hundred professional staff members. How much improvement has resulted can be assessed only indirectly.

Opinion prevails that our internal reporting has become noticeably better over the past decade. A further clue is the attitude of journal editors; over a period during which their standards have supposedly become stricter, our publications have fared better. Perhaps the surest indication is that some of our best writers have returned voluntarily and repeatedly for further assistance.

The prominence of organization as a weakness suggests that writing ability may not be the sole problem in communication among scientists and engineers.

Of the three steps in solving a problem—planning the attack, working it out, and communicating the results—the first and last are related more closely than their fore-and-aft positions might suggest. Certainly, a soundly conceived attack is easier to explain than a haphazard one, just as it is easier to work out.



Likewise, early recognition that the job will not be done until it is reported argues convincingly for better planning. Perhaps these are simply other ways of saying that often the most-productive scientists and engineers are those who do the best job of communicating in writing.

If so, attention to written communication is well worth cooperative effort by supervisors, scientists and engineers and writing experts.

The supervisor had best devote most attention to those aspects of science and engineering for which his experience best qualifies him: planning the attack and organizing the report.

The individual scientist at the bench or engineer at the desk can then apply his ingenuity more intensively to his role: working out solutions and drafting the report.

Writing experts can then direct their talents exclusively to the final step: communicating the results and smoothing and sharpening the report.

Why the major seller of new equipment is your logical supplier of used equipment

When you are in the market for a used car, chances are you can get your widest choice and best value from the dealer who sells the most new cars.

This is also true in the oil country supply business. National Supply, as the leading supplier of drilling and production equipment and tubular products, usually can offer you a choice of used equipment capable of giving excellent service.

Used equipment items generally available through your National Supply store include complete rigs and auxiliary equipment—everything to round out your drilling equipment needs. National Supply also is the place to look for used pumping units and accessories, and tubular goods—drill pipe, casing and tubing.

No matter what your requirements—new or used equipment, repair parts, general supplies, or just sound, technical advice—you'll find that the National Supply store is your most reliable, economical source. There are 118 of these stores located strategically to serve you. Next time you buy, see National Supply.

See next pages for announcement of new J-50 triplex pump

National Supply announces

Three J-50 triplex pumps are operating in this water flood installation near Wichita Falls, Texas. Large plungers available for the new National Supply J-50 give it the capacity to produce a higher volume than any comparable triplex pump.

NEW J-50 TRIPLEX PUMP

for Water Flooding · Power Oil Service Salt Water Disposal

A new horizontal triplex pump, the J-50, is announced by National Supply for many applications such as water flooding, salt water disposal and power oil service. The pump is rated at 50 input horsepower.

The new J-50 triplex pump offers low initial cost, plus a proven ruggedness and smooth operation that will minimize your downtime.

Some of the important advantages are:

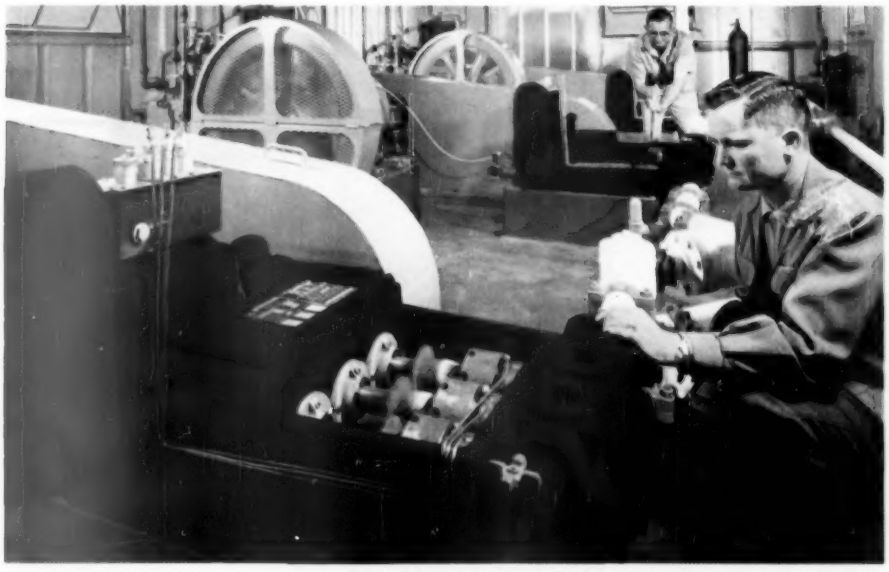
BUILT-IN SUCTION DAMPENER. The diaphragm-type suction dampener runs the full length of the fluid end, directly beneath the suction valves, to provide optimum dampening effect. This prevents harmful surges from developing in the suction piping.

LIGHTWEIGHT ALUMINUM ALLOY CONNECTING RODS. They permit operation at higher pump speeds, with greatly reduced inertial loading. Connecting rods form their own bearing surface, give long, trouble-free service.

DOUBLE EXTENSION CRANKSHAFT. Made of forged steel, it permits a direct or a V-belt drive connection to be made without reversing the crankshaft. Double extension enables you to connect auxiliary drives, such as chemical, sump or charging pumps.

SPECIAL FLUID END FOR POWER OIL SERVICE. The J-50 can be equipped with a fluid end built especially for power oil service. Important features are the quick change liners and plungers. Large plungers, for high volume, can be used when the hydraulic down-well pump is to be run into the hole. The large plungers can then be replaced quickly with smaller plungers for high production pressures. Fluid ends can be furnished with a full flow, full opening, ball-and-seat valve arrangement which eliminates restrictions beneath the ball.

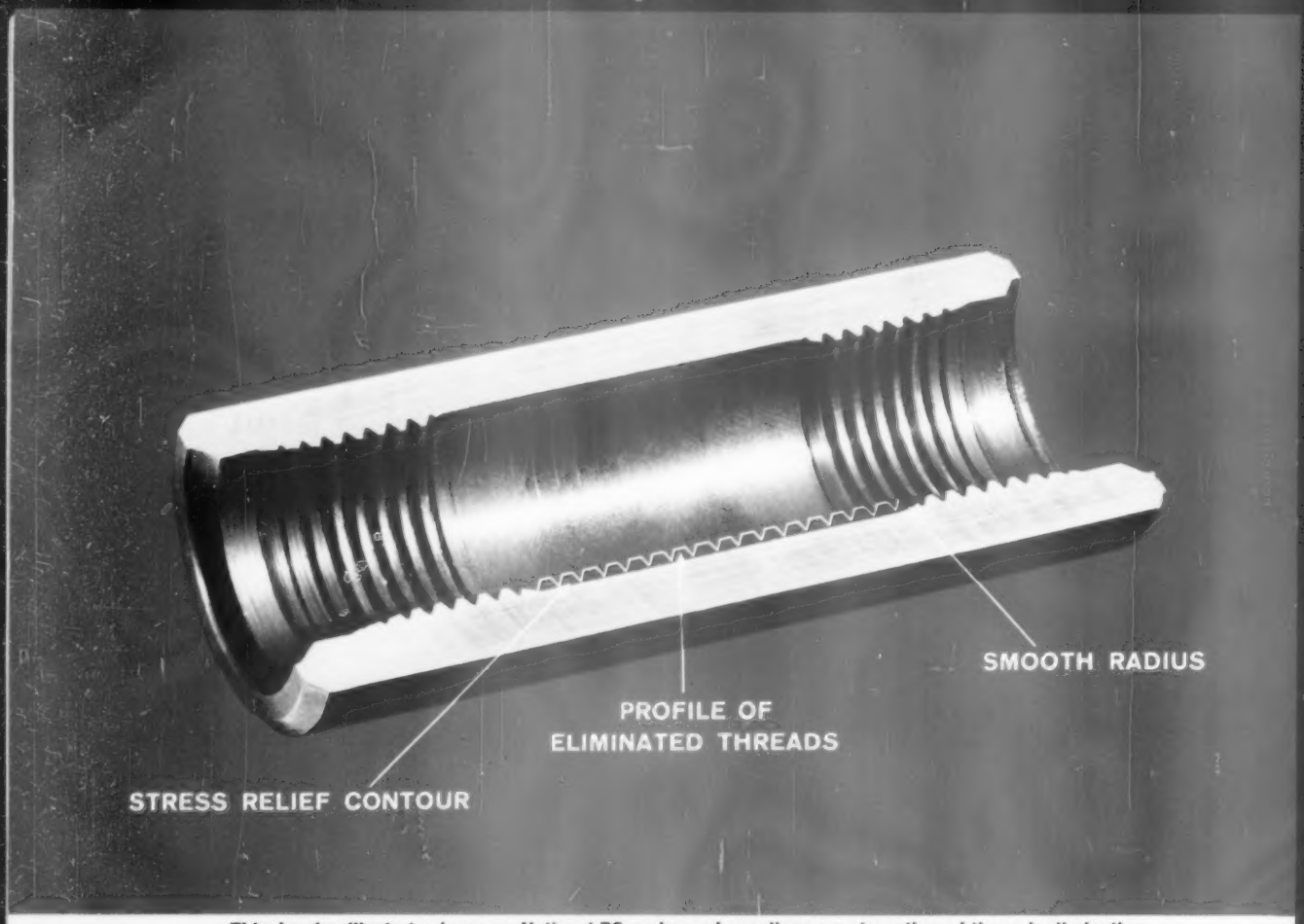
The National J-50 pump is now available in three models: the J-50 L and J-50 M for low and medium pressures in corrosive and noncorrosive service, and the J-50 PO for power oil service. Literature on this versatile new pump is yours for the asking. Write today to National Supply Division, Armco Steel Corporation, 2 Gateway Center, Pittsburgh 22, Pa.



The J-50 has an integral suction pulsation dampener extending the full length of the fluid end, directly below the suction valves for maximum efficiency. Performance and maintenance features include all those of the popular National J-125 triplex pump.

Steel

Steel's Symbol of strength, long life, and economy



This drawing illustrates how new National RC sucker rod couplings are strengthened through elimination of unused threads. Ask your National Supply representative for details.

Now! High-strength, stress-relieved couplings to improve performance of high strength sucker rods

High-strength, stress-relieved sucker rod couplings designed to match the strength and performance of high-strength rods are now available from National Supply.

The design of the new coupling eliminates unused threads that formerly ran through the center of the coupling. This eliminates danger of premature failure from stress concentration at the roots of unsupported threads. The new National RC coupling has a smooth finish in this central area which blends into the last engaged threads, thus increasing fatigue strength.

Tensile strength has been increased to 130,000 psi by heat treatment. National RC couplings are available in four sucker rod sizes—⅝, ¾, ⅞ and 1 inch—and will be standard on National Grades 45, 85 and 92 sucker rods.

Get complete information on new National RC couplings by writing to National Supply Division, Armco Steel Corporation, 2 Gateway Center, Pittsburgh 22, Pennsylvania.

ARMCO National Supply Division

BY W. L. NELSON, Technical Editor and Petroleum Consultant

Depreciation fails to provide replacement costs

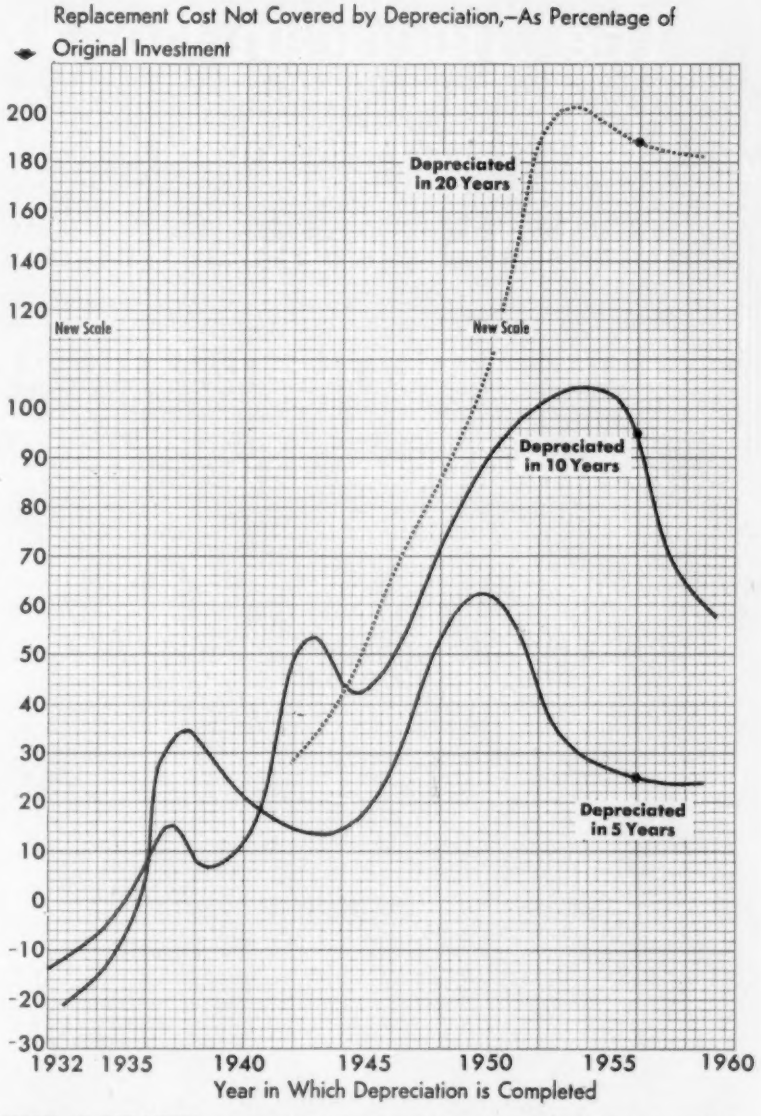
A SMALL PART of the original plant investment disappears into each gallon of product sold from a refinery because in time the refinery or parts of it become worn, it is destroyed by corrosion, or the process may become obsolete. Our laws recognize this depletion of capital or original cost by allowing the installation cost to be depreciated over a period of years (U. S. Treasury Department, Bureau of Internal Revenue, Bull. F., Jan. 1942) without taxes. Rates of depreciation that have been accepted by our revenue agencies were published in Costimating No. 10, April 23, 1956.

If the business organization is to continue in business, funds must be available for replacement of worn machinery or the purchase of entirely new, more modern equipment. Thus, the depreciation can be set aside each year into an amortization fund. However, such a program requires a stable value of the currency and during recent years the value of our currency has decreased rapidly, especially in terms of the cost of new process equipment.

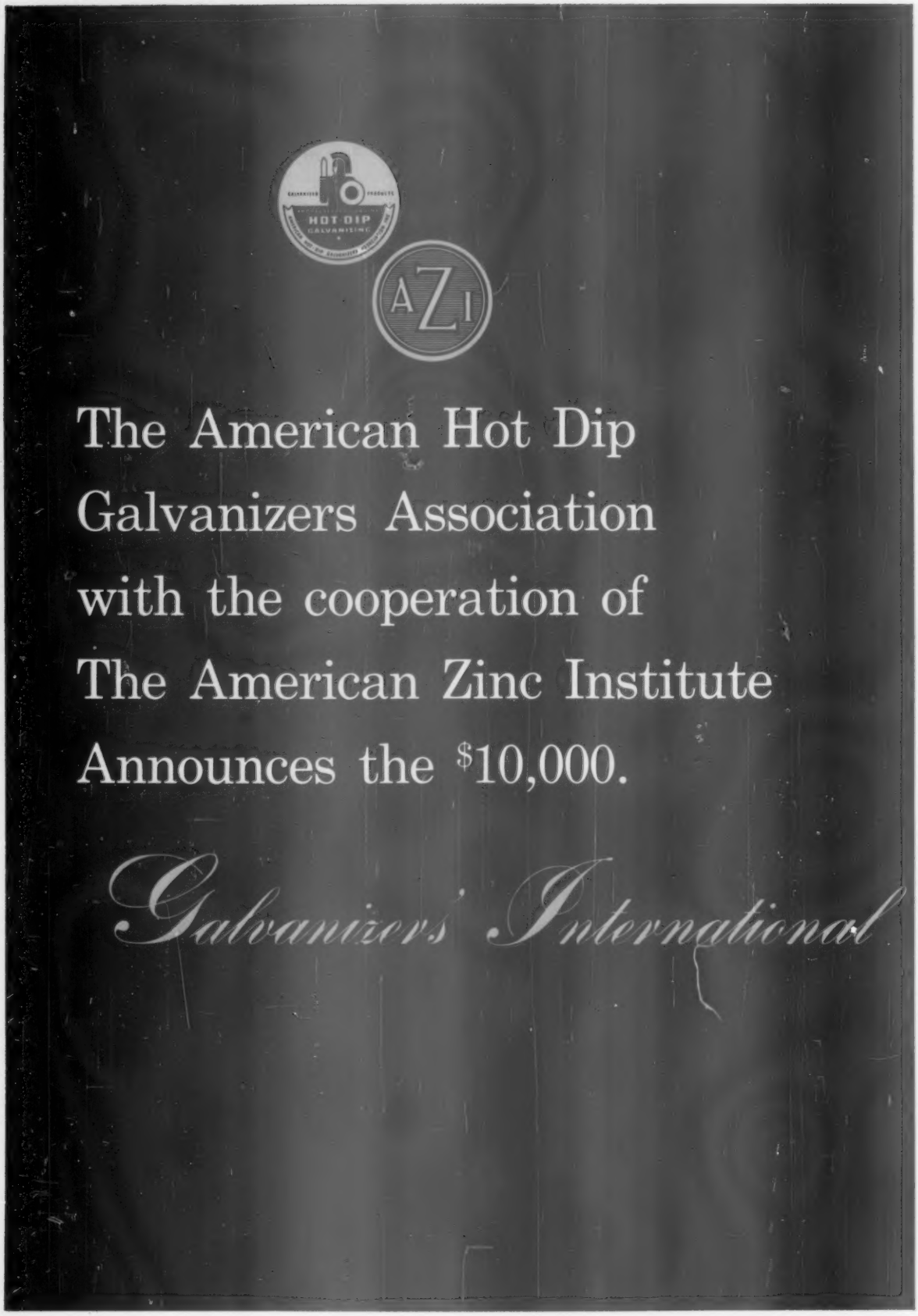
Theoretically, an amortization fund would, at the end of the depreciation period, represent 100% of the original investment. In actuality, costs have risen so rapidly that during 1950-1956, it was necessary to add 50 to 200% of new capital to the amortization fund when time for replacement arrived. Fig. 1 was derived from the values of the Nelson Refinery Construction Cost Index (in first issue each month of The Oil and Gas Journal) back to 1926 (and at earlier dates by use of the ENR Construction Cost Index).

The meaning of the chart (Fig. 1) can be best explained by illustrating its use. Consider the year 1956. Equipment purchased in 1936 and depreciating during 20 years (to 1956) is represented by the top curve labeled "Depreciated in 20 Years." Although 100% of the original (1936) cost is available in the amortization fund by 1956, it is necessary to add 188% of new money, making a total 1956 replacement cost equal to 288% of the original investment. The situation is better, but not good, for equipments depreciated in 10 or 5 years, the new capital required being only 95 and 24% respectively. Rising portions of the curves indicate a large and increasing need of new capital to care for replacement. In addition, new capital is needed for increase in capacity, for new processes which improve quality of product, and in small degree to take care of obsolescence.

The shape of the curves since 1956 appears to indicate that amortization funds have been somewhat more adequate for replacement costs than during the 1944-56 period. This should not be confused with tight or easy money because the availability of money is dependent on very many factors as well as the adequacy of amortization funds.



EFFECT OF INFLATION, percentage (of original investment) by which depreciation has failed to provide replacement costs of refineries. Fig. 1.


HOT DIP
GALVANIZING
AZI
The American Hot Dip
Galvanizers Association
with the cooperation of
The American Zinc Institute
Announces the $10,000.
Galvanizers' International

Ten Awards of $1,000. Each

Ten awards are to be made to entrants selected by the judges. Each award will consist of $1,000 in cash, a suitable medal and a Certificate of Achievement.

This is not a contest—it is a search for new ideas. ■ *Your entry, therefore,* will not be judged against others, but solely on its merit and value in developing new applications and markets for Hot Dip Galvanizing. ■ If your idea, in the opinion of the judges, is of practical value to the industry, you will be cited for an award—promptly. ■ Because the Hot Dip Galvanizing Industry is anxious to receive ideas of this type, the judges reserve the right to present *more* than 10 awards, if the entries warrant.

CONDITIONS ■ Anyone in the world (except members of the American Hot Dip Galvanizers Association and the American Zinc Institute, and their employees and advertising agencies) may submit one or more entries. ■ Entries will be considered by the judges promptly upon their receipt. No entry received after April 30, 1962 will be considered. ■ The Awards will be made for ideas pertaining to: (a) Applications of Hot Dip Galvanizing to a *new or unusual* field, or; (b) An *improvement* in application in fields where Hot Dip Galvanizing is now being used, or; (c) New methods of *after-treatments* of Hot Dip Galvanized products. ■ Each entry submitted must contain: (a) Description and documentation of application. (b) Case history of the application or process accompanied by photo, drawings, formulae, etc. (c) All technical data needed for the utilization of the idea submitted. (d) Release of the application or idea for general use without payment or royalty other than the $1000 award. ■ The decision of the judges will be final. Award-winning ideas will be retained by the American Hot Dip Galvanizers Association for dissemination throughout industry. Other entries will be returned. ■ No formal entry blank is required but the entry should be accompanied by the name, address and business connection of the individual submitting it. Business firms or corporations may submit entries under their business name, instead of as individuals, if they choose to do so. ■ Entries should be sent to: AMERICAN HOT DIP GALVANIZERS ASSOCIATION, INC., 5225 Manning Place, N.W., Washington 16, D. C. ■ *Note:* For information on galvanizing write to the above address for name and location of the American Hot Dip Galvanizers Association member nearest you.

Awards

FOR ACHIEVEMENTS IN RESEARCH, DEVELOPMENT AND UTILIZATION OF GALVANIZED PRODUCTS

THE JUDGES ■ Dr. Clarence H. Lorig, Technical Director, Battelle Memorial Institute and Past President American Society for Metals. ■ Mr. John R. Daesen, Technical Director, American Hot Dip Galvanizers Association. ■ Mr. John L. Kimberley, Executive Vice President, American Zinc Institute.

The

FOREMAN'S PAGE

PART 2—HEAT TRANSFER

Three factors are key to finding heat-transfer rate

HEAT-TRANSFER rate is the speed at which heat is transferred. It determines how big our heat-transfer equipment must be and in many cases also limits unit capacity. Most heat-transfer applications involve all three types of heat transfer (conduction, convection, radiation). In each of the three, heat is transferred by different means and therefore different factors must be considered.

Convection. Heat-transfer rate by convection is determined by the speed of movement or mixing of the fluid. In most cases the fluid is in rapid enough motion for other process reasons to carry the heat away adequately.

Radiation. The speed at which heat is transferred from one object to another depends upon four things:

1. Distance between the objects. Heat rays dissipate or thin out with distance just as light rays get dimmer the farther away the light is. The rate of heat transferred by radiation varies inversely with the square of the distance. This means that if you stand 1 ft. from an open fire you will receive 9 times as much radiated heat than if you stand 3 ft. away.

2. Size of the object receiving heat. Two 20-ft. radiant tubes in a furnace will receive twice the heat (B.t.u.'s) in a given time that one 20-ft. tube will, if all other things are kept the same.

3. Temperature difference between the objects. Heat always flows from a high temperature to a lower temperature. The amount of heat transferred by radiation varies as the absolute temperature to the fourth power.

For example, a flame at 1,100° F. (1,559° absolute temperature) will radiate 32% more heat to a water-cooled tube at 212° F. than with a flame at 1,000° F. (1,449° absolute temperature).

4. Type of surface. Bright and shiny surfaces reflect heat just as they reflect light. Dark and dull surfaces absorb heat. Objects which are good absorbers of heat are also good radiators; those which reflect heat are poor heat radiators. For maximum heat radiation a home radiator should be painted a dull dark color and not a bright and shiny color like aluminum.

Conduction. The rate at which heat is conducted through a material depends upon four factors.

1. Area. The larger the area the more heat that can be conducted in a given time.

2. Temperature difference. The greater the temperature difference between hot and cold the faster the heat transfer will be. Temperature is the driving force which pushes the heat through. Temperature is similar to voltage in an electrical circuit or pressure in an hydraulic system.

3. Thermal conductivity. The ability of a material to conduct heat is known as its thermal conductivity. For example, copper conducts heat readily and is said to have high thermal conductivity; wood is a good insulator and has a low thermal conductivity. Metals usually have high conductivities. Gases or materials which trap air in pockets have very low conductivities. Condensing vapors have very high conductivities.

4. Thickness of material. The greater the distance the heat has to move the slower the heat transfer will be.

When heat is conducted from one substance to another it usually has to pass through several heat "barriers" each having different conductivities. For example, consider a steam space heater. Steam gives up its latent heat of condensation to the metal tube. However, for heat to get to this metal tube it has to pass through a "film" of condensing steam which coats the tube. Condensing vapor films have high conductivities.

Once heat gets through the steam film it has to pass through the metal wall of the tube. Metal also has a high conductivity.

Heat now has to pass through a film of air to get to the main body of air. This air film is a very poor conductor of heat and it will limit the rate at which heat will be transferred. Because of this, fins are put on auto radiators to increase the amount of metal in contact with the air.

If the air in contact with the metal radiator is moved faster, this air film will be thinner and not limit the heat as much. Therefore, a fan is installed to pull air through the radiator.

The rate at which heat is transferred can be worked out by a mathematical formula: $Q = U \times A \times \Delta T$ (Fig. 4).

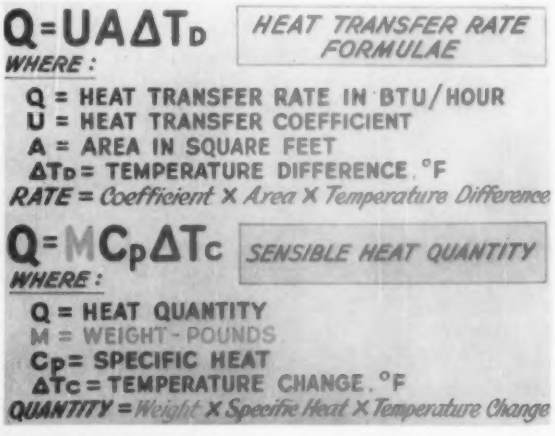
Q stands for the heat-transfer rate in B.t.u. per hour.

U is a number much like thermal conductivity except that it stands for the ability of an entire system to pass heat instead of a single material. It's called a heat-transfer coefficient.

For instance, in the above example the ability of heat to pass through the condensing-steam film, the metal tube, and the air film on the outside of the metal tube is measured by the heat-transfer coefficient. The ability of the metal tube only to pass heat is known as its thermal conductivity.

A is the area through which heat passes.

ΔT is the temperature difference between the hot and cold materials.


Q=UAΔTD
HEAT TRANSFER RATE FORMULAE
WHERE:
Q = HEAT TRANSFER RATE IN BTU/HOUR
U = HEAT TRANSFER COEFFICIENT
A = AREA IN SQUARE FEET
ΔTD = TEMPERATURE DIFFERENCE, °F
RATE = Coefficient X Area X Temperature Difference
Q=MCpΔTc
SENSIBLE HEAT QUANTITY
WHERE:
Q = HEAT QUANTITY
M = WEIGHT - POUNDS
Cp = SPECIFIC HEAT
ΔTc = TEMPERATURE CHANGE, °F
QUANTITY = Weight X Specific Heat X Temperature Change

USING THESE FORMULAS, the rate at which heat is transferred can be worked out. The heat-transfer rate determines how large condensers and exchangers must be. Fig. 4.

This material taken from process-training-program manual, Bayway, N. J., refinery of Humble Oil & Refining Co.

HIGH PERFORMANCE STANDARDS THROUGH

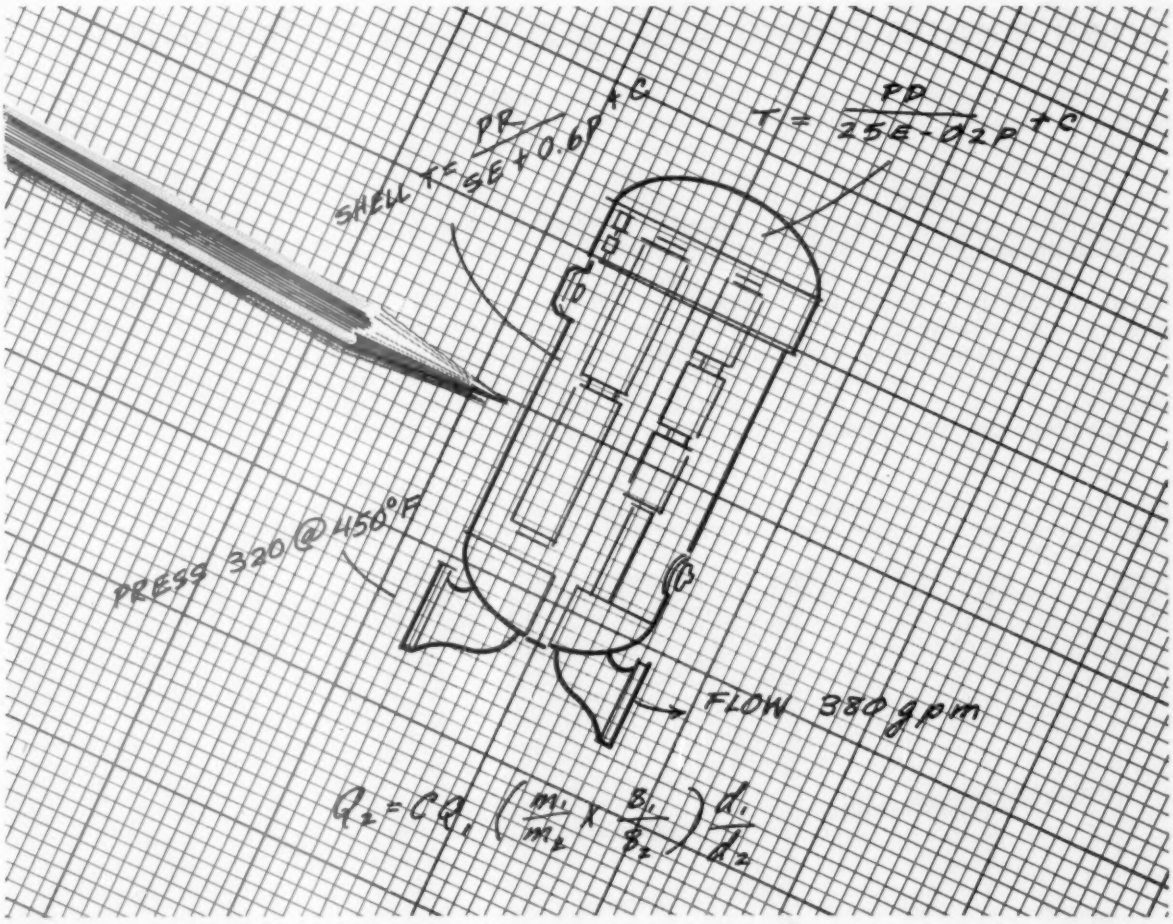
UNITIZED DESIGN

THE UNITIZED DESIGN OF WARNER LEWIS SPACE SAVER SEPARATOR/FILTERS provides the ultimate protection against water and solids contamination.

The proven superiority of Warner Lewis two-stage design is enhanced by the close correlation of over-all vessel design with details of element construction. The result: Unitized Design to achieve the highest performance standards — which are maintained only by the use of Warner Lewis factory engineered replacement cartridges.

Minimum dimension, high volume Space Saver units are designed for refuelers and hydrant carts, and for fuel farm and bulk plant installations. They are in world-wide service with the U. S. Air Force and other branches of the military services. They are installed in fueling facilities serving most of the world's major airports.

For further information, write Aviation Products Division, Warner Lewis Company.


SHELL $t = \frac{PR}{SE \times 0.6P} + C$
$t = \frac{PD}{2SE - 0.2P} + C$
PRESS 320 @ 450°F
FLOW 380 gpm
$Q_2 = CQ_1 \left(\frac{m_1}{m_2} \times \frac{B_1}{B_2} \right) \frac{d_1}{d_2}$

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WARNER LEWIS COMPANY
DIVISION OF FRAM® CORPORATION

NEW OFFICE building at Emeryville center . . .

. . . **FORMERLY** was a five-story warehouse.

Shell expands big California research center

A 5-YEAR expansion program has nearly doubled the size of Shell Development Co.'s Emeryville, Calif., research center.

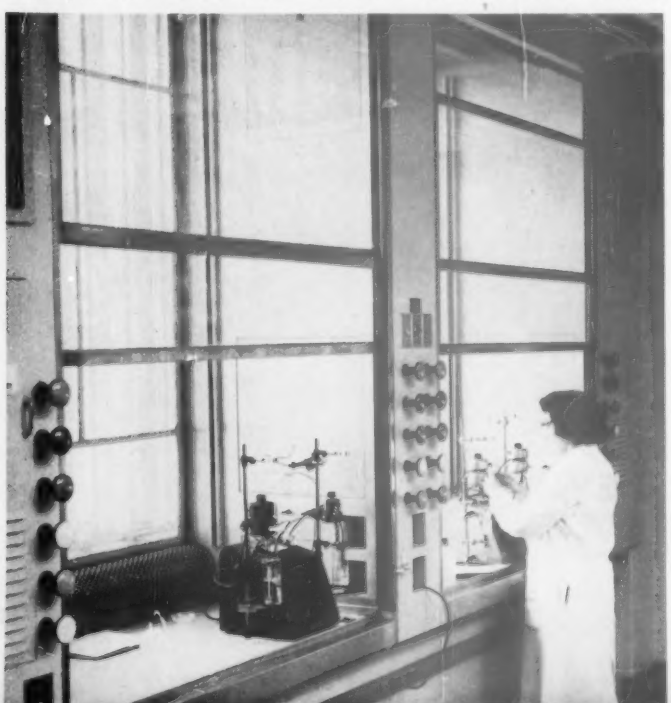
The expansion primarily was a case of remodeling a five-story warehouse and adjoining garage and one-story warehouse which Shell acquired in 1954 from a company whose property adjoined the center. The expansion increased laboratory and office floor space to almost 500,000 sq. ft.

The big warehouse was converted into Emeryville's main building. The garage now houses engineering laboratories and a 295-seat lecture hall, and the one-story warehouse is a new fuels and engine lubricants lab.

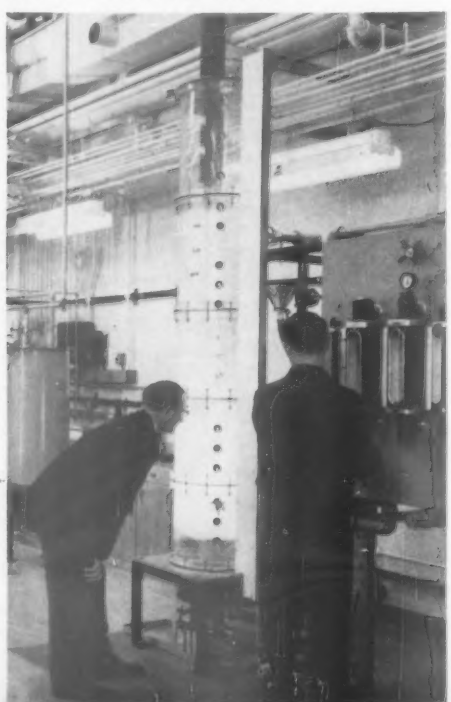
Fitting for a research center, Shell came up with a novel construction plan of converting the buildings to research use. The company decided to build a "skin" or second wall outside of the original walls of the buildings. The space between the two walls has been used for exhaust ducts, drain pipes, and utility and service lines. This space permitted Shell to replace windows in the old building with fume hoods without losing any outside light. The rears of the hoods are made of safety glass which serves as windows for the buildings.

The growth of the center, located across the bay from San Francisco, is pointed up by the growth of the payroll. When the center was opened in 1928, there were 35 scientists employed. Today approximately 1,300 are employed.

ODORS at Emeryville lab are funneled out fume hoods which replaced windows in old building. A new exterior was added to old building with space left between walls for fume hoods and other fixtures.



KING-SIZED test tubes in fundamental chemical engineering research labs at Emeryville are used for bubble-flow studies.

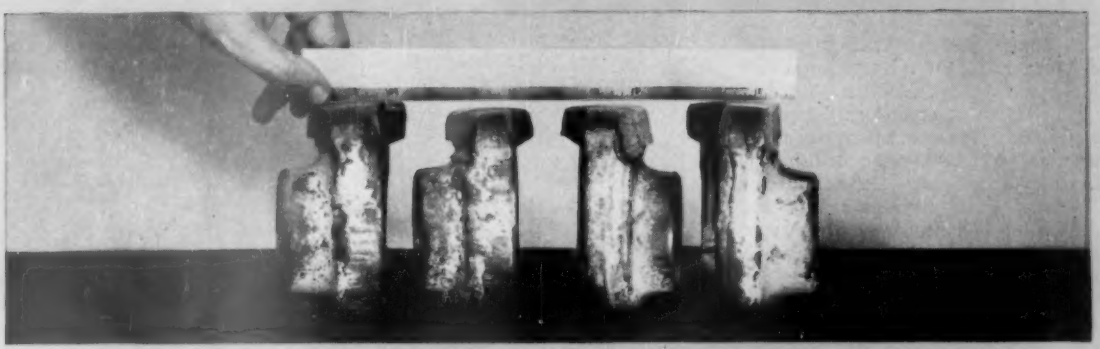


Special Report to Users of Caterpillar Equipment:

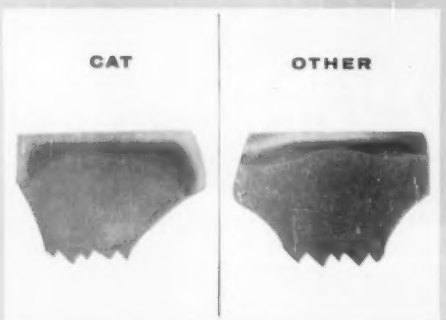
CAT CATERPILLAR

WHAT YOU DON'T SEE CAN HURT YOU

You can buy a lot of parts that *look* like genuine Caterpillar parts. Some may be cheaper initially. But they are as different as night and day when you get them in service.



Take these links, for example. They all *looked* identical when new. But see what has happened after 2000 hours on the same D8 Tractor! The two links in the center, a popular brand with induction-hardened rails, cost about 9% less than Caterpillar links originally, but showed about *50%* more wear.



The extra service you can expect from the Cat links can be seen and compared with other brands. Here are actual photos of etched cross sections of *production* links made by Caterpillar and the other manufacturer. The light areas at top show case depth and pattern of wear-resistant rail material resulting from heat treatment. See the deep, uniform wear case on top *and sides* of the Cat part? It's as hard as a good ball-peen hammer head. But in the other brand, the wear case varies both in depth and hardness . . . that's the reason why after 2000 hours on a D8 the Cat-made links had worn 50% less.

Investigate and you will find superiorities for every undercarriage component built by Caterpillar. This extra quality—though it sometimes costs a little more initially—pays off by delivering *extra* trouble-free working hours. That's why genuine Caterpillar parts cost you less per hour than other brands.

And when it's time to replace or rebuild your tractor undercarriage, see your Caterpillar Dealer. He is an undercarriage specialist with modern facilities to back him up. Get the full story on his many money-saving options and recommendations *tailored to your job conditions.* Truly CUSTOM TRACK SERVICE, designed to save you money . . . and offered only by your Caterpillar Dealer.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U. S. A.

CATERPILLAR

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BY W. L. NELSON, Technical Editor and Petroleum Consultant

Questions on TECHNOLOGY

More on LPG storage

STATEMENT: Although your "Construction, Operating Costs of LPG Storage," The Oil and Gas Journal, May 9, 1960, p. 142, contained useful and interesting information, we can supply recent developments that may be of interest.

"At present there are at least three and possibly more, liquefied-natural-gas storage vessels, in addition to the Moscow installation. These are:

"1. A 35,000-bbl. (124,000,000-std. cu. ft.) storage vessel at Lake Charles, La., constructed by Chicago Bridge & Iron Co. for Constock Liquid Methane Corp., in 1958.

"2. At the other end of the Methane Pioneer Transportation, two tanks were constructed for the British Gas Counsel on Canvey Island in the Thames River, by Whessoe, Ltd., and APV Co., Ltd. The total capacity of these two tanks is the same as that in No. 1.

"3. We understand that a methane tank also has been constructed in France but have no further information.

"In addition to the atmospheric-pressure propane storage used by Atlanta Gas Light Co., there is now approximately 160,000 bbl. of atmospheric storage for LPG in Saudi Arabia.

"The costs of storage tanks for liquefied natural gas have changed somewhat with improvements in design and increase in the size of individual storage vessel, so that at present, in the case of total storage exceeding 500 million standard cubic feet, the cost would be about $2.45 per thousand standard cubic feet in aboveground insulated tanks."

Heat exchangers in the Nelson Index

Your articles on costs are most useful and they are a valuable addition to the literature. Has the percentage of weight used in the Nelson Refinery Construction Cost Index for heat exchangers been changed since the base 1946 index? C.A.H.

The original index weightings and those used since August 1956 are shown in the tabulation here. The weighting of exchangers has been increased by 50%.

Materials	% (1946)		% (1956)	
Iron and steel	24	60	20	50
Building material	8	20	8	20
Exchangers	1.6	4	2.4	6
Instruments	1.6	4	2.4	6
Pumps, etc.	1.6	4	2.4	6
Engines, etc.	1.6	4	2.4	6
Electrical equipment	1.6	4	2.4	6
		100		100
Labor				
Skilled	30		30	
Common	30		30	
	100		100	

One must realize that the proportions (weightings) of the index do not necessarily represent the proportions of equipments used in construction.

What's the speed of the fastest new oil tankers?

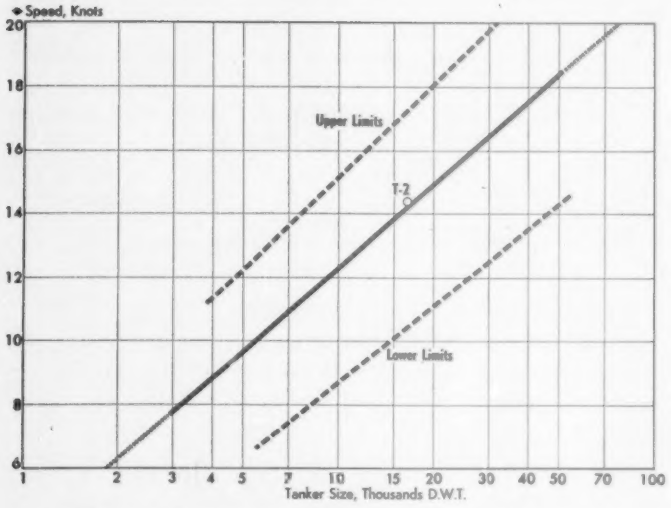
In your answer of September 19, 1960, entitled, "The World Tanker Fleet in 1965?", you did not indicate the speed of large tankers. How fast are the new 65,000-ton tankers? S.Wm.T.

Although there are large variations in the speed of vessels, the relationship between size and speed is somewhat as shown in Fig. 1. A 65,000-dw. ton tanker should have a speed of about 19.4 knots. (A nautical mile is 6,080.2 ft.—or 1.15 miles) and for other vessel sizes:

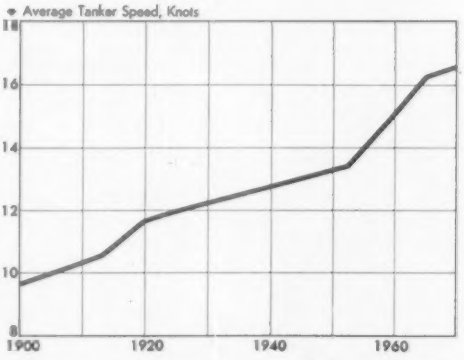
Dw. tons	Knots
5,000	9.7 (6-12)
10,000	12.4 (8.7-15.2)
*16,600	14.4
20,000	14.9 (11-18)
30,000	16.4 (12.5-19.7)
40,000	17.5 (13.5-20.5)
50,000	18.4
60,000	19.1 (est. 17-21.5)
†70,000	19.6
†80,000	20.1
†100,000	20.8

*T-2. †Estimated.

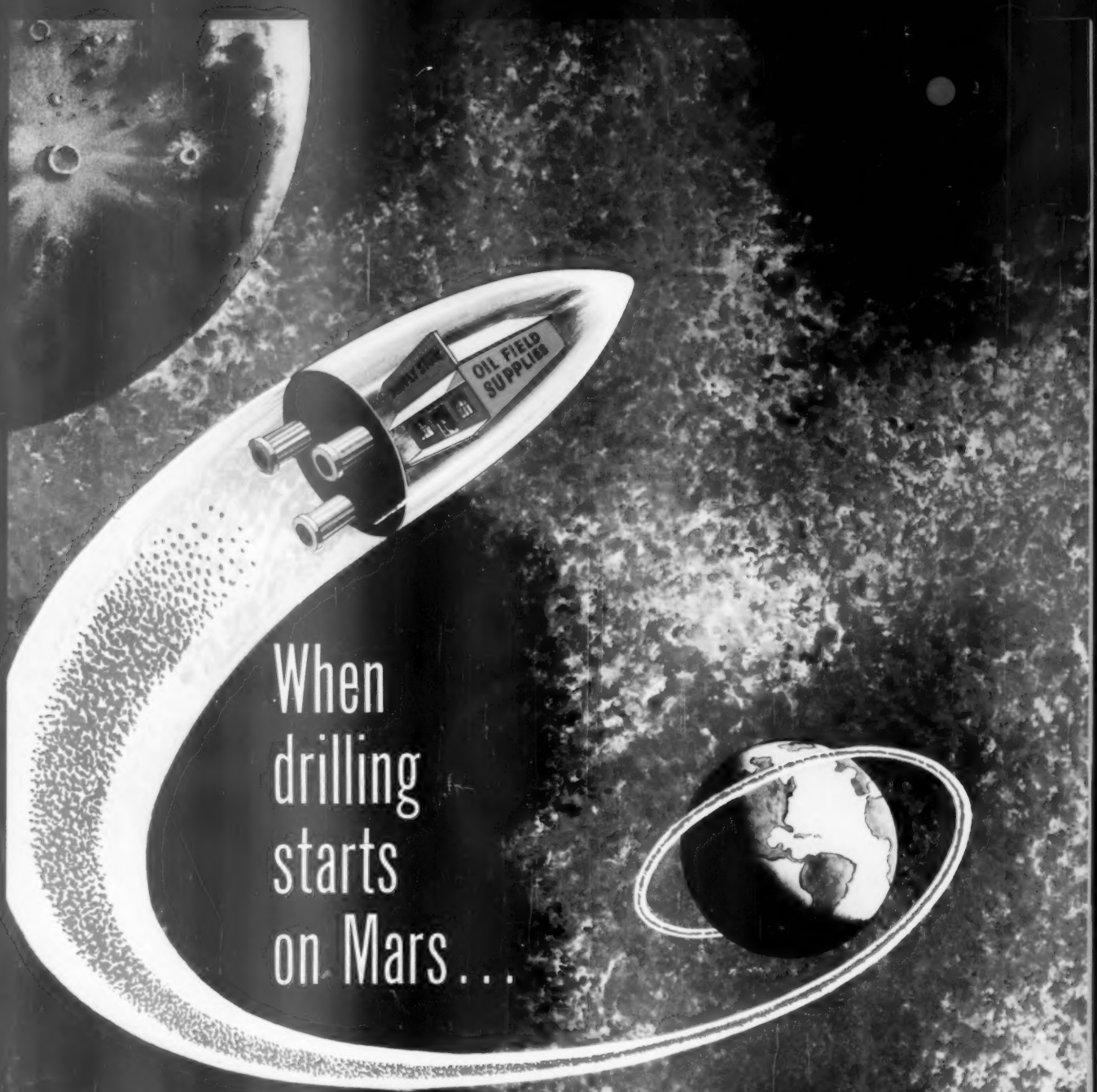
The speed of the average tanker of the world fleet (since 1900) is indicated in Fig. 2.



SPEED as a function of size (approximate) of tanker. Fig. 1.



SPEED of the average tanker fleet since 1900. Fig. 2.



When drilling starts on Mars...

Sound fantastic? Hold up a minute. Plans already have been made to drill on the Moon, and soon. We'll agree that more cheese may be found than oil, but if oil *is* found supplies will be needed. And, as always, your OIL FIELD SUPPLY STORES will be ready to do the job.

For availability and convenient job location, you just can't beat an OIL FIELD SUPPLY STORE. On Earth or on Mars, we urge you to take advantage of their fast and efficient services.

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PESA

Shrinking Dollars

Mean Shrinking Profits

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Equipment investment costs are more critical today than ever before.

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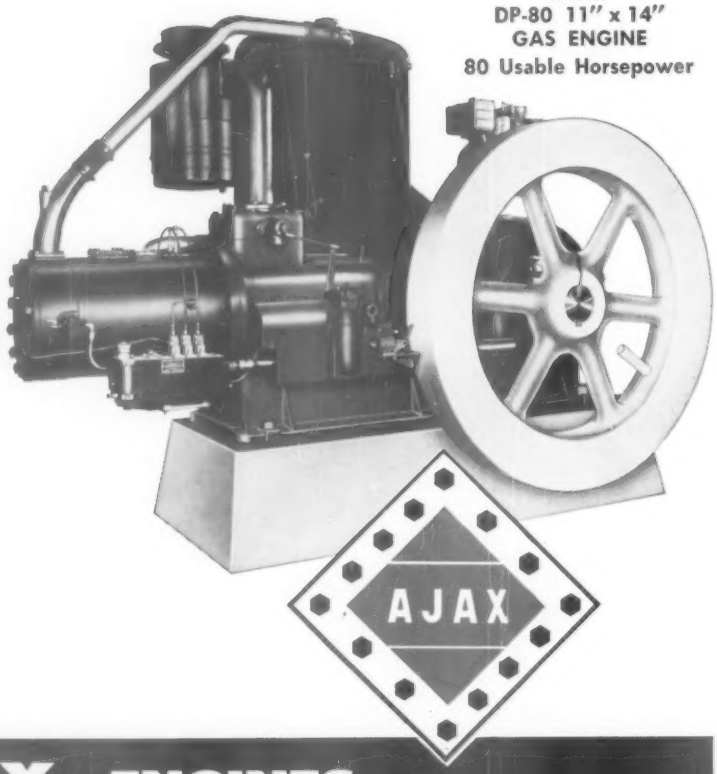
Introducing the NEW DP-80 11" x 14" GAS ENGINE 80 Usable Horsepower



AJAX ENGINES

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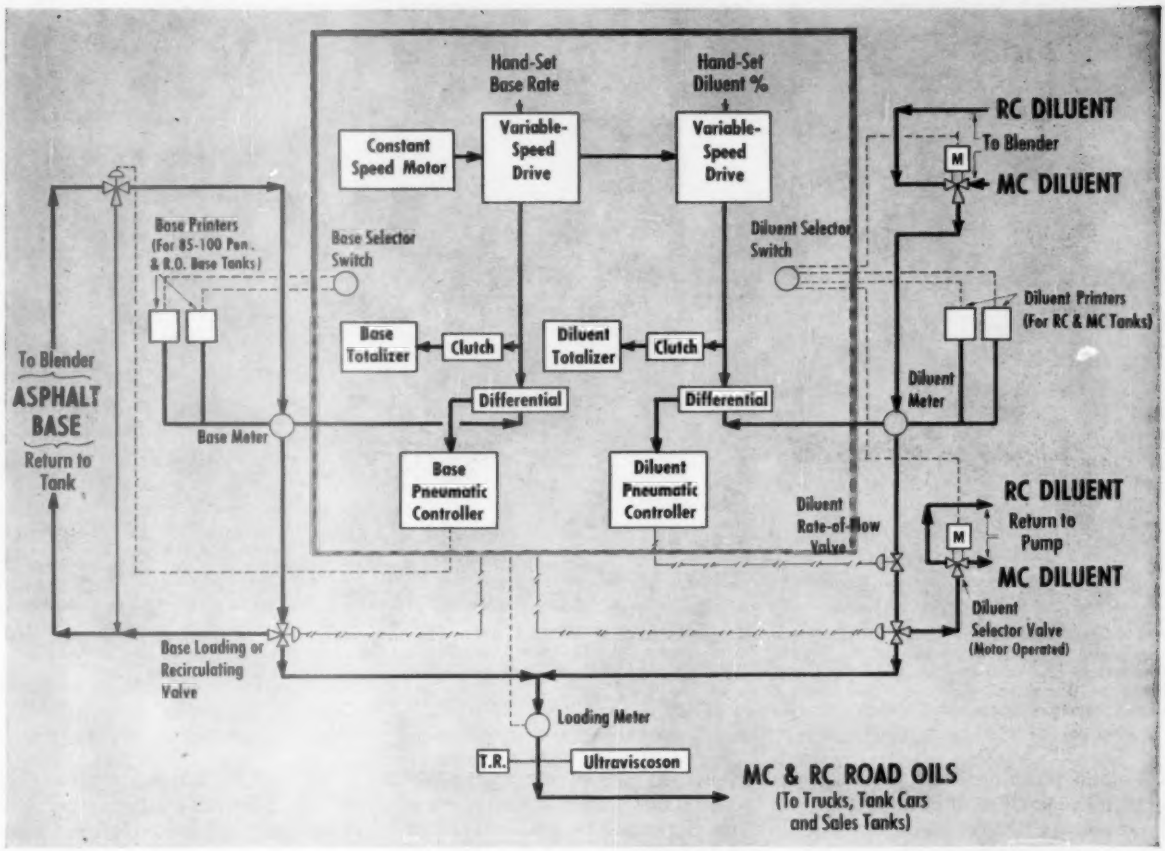

BLENDER OPERATION is outlined in these series of steps showing the path from storage tank to truck. Fig. 1.

Phillips speeds up asphalt service

The peak of the highway building season always imposes a strain on road-building contractors and state and federal highway officials. Projects must be pushed through in minimum time while keeping an eye on the weather and other factors. With this in mind, Phillips Petroleum Co. installed automatic blenders to make uniform cutback asphalts available immediately on call.

BY KENNETH W. BROOKS
District Editor

AUTOMATIC BLENDERS for RC and MC cutback asphalts have been installed by Phillips Petroleum Co. at four of its refineries—Woods Cross, Utah; Kansas City, Kans.; Okmulgee, Okla.; and Great Falls, Mont. Phillips is also looking ahead to other measures to help minimize handling, testing, and other delays involving road-building materials which are costly to the state, contractor, the refiner, and ultimately all taxpayers.

Basically, all four of the installations are the same. They vary from one another only in a few of the refinements.

At the Kansas City refinery, two proportioning blenders have been installed with the necessary pumps, meters, and tanks. Provisions have been made for installation of two more automatic blenders in the future.

A graphic panel is located in the control room. On this board are mounted the start-stop stations for the base asphalt and diluent pumps, controls for the three-way valves, and lights to indicate valve positions and equipment operation (Fig. 2). Flow lines are laid out on the panel to indicate possible flows of asphalt base, diluent, and blend. Electric interlocks insure correct selection of base stock and diluent tanks.

Base and diluent meters are set under the dock directly below the blender-unit cabinets. The mechanical drive on the meter controls the blender through flexible shafting going up through the floor of the dock.

The refinery handles Mid-Continent feed stocks which include a lube crude, western Kansas crude, and a mixture of Texas, Oklahoma,

ALL CONTROLS for the blenders are mounted in this panel with the exception of the set-stop loading meters and start-stop switches for base pumps. Lines on the panel indicate flow possibilities of asphalt base, diluent, and blends. Fig. 2.

LOADING METERS are equipped with ticket printers to show the customer the temperature-corrected volumes of base asphalt and cutter stock. All of the information he requires is printed on the one ticket. Fig. 3.

Colorado, and Kansas crudes. These are kept segregated at Phillips' pipeline and in the refinery so that premium lube oils may be made, and also to make road oils and asphalts.

One of the base stocks for road oils and asphalts is the residuum from the proper deasphalter. The lube crude is processed through the crude unit, lube vacuum unit, and propane deasphalter (OGJ, May 30, 1955, p. 95). The other two crudes are processed in a blocked operation to make resids for flux, road oils, asphalts, and for fuel oil.

Diluent for the MC road oil is a distillate with the boiling range of 345° to 575° F. Diluent for RC road oils is a special reforming stock with the boiling range of 215° to 425° F. Diluents for SC road oils are light and heavy cycle oils from the cat cracker.

As part of the program to provide better asphalt blending and loading service, residual storage at Kansas City has been increased from 256,000 to 382,000 bbl. Base storage tanks have been equipped with sloping bottoms and bottom suctions to eliminate the hazard of water in hot asphalt and to increase the available inventory of asphalt base. In-tank, gas-fired heaters were installed in five of the base tanks to maintain proper base temperatures. Jet mixers were installed in most of the tanks to improve uniformity of both base and finished stock. The added storage is served by new pumps and insulated steam-traced lines. New rotary gear pumps and centrifugal diluent - handling pumps were installed to supply the blenders.

Automatic Blending

Asphalt base is supplied to each blender from storage by a separate pump (Fig. 1). Rate of flow of the asphalt base is controlled by a three-way flow-control valve ahead of the asphalt base meter. This valve bypasses the amount of base not required by the blender to the recirculating line back to the base tank and allows the correct amount of base to go through the meter. This is necessary, as positive - displacement rotary gear pumps are used to transfer the base. After going through the meter, the base passes through a three-way valve that is either in the recirculating position or in the loading position. In the recirculating position, the base going through the valve joins the amount bypassed ahead of the meter and returns to the base tank.

MC and RC diluents are pumped to the blenders with centrifugal pumps over separate lines and with separate recirculating lines back to the suction of the pumps. Either diluent may be used to either blender with the use of three-way, motor - operated selector valves on the inlet and outlet of each blender. These valves are operated by the diluent selector switches on the blend panel. The flow of the diluent selected is through the selector valve, through a meter, through a rate-of-flow control valve and through a three-way valve that is either in the recirculating position or loading position. When this valve is in the recirculating position, the diluent is returned to the suction of the correct pump through the outlet diluent-selector valve.

Before loading, recirculation of both base and diluent is set up through the blender so that the correct amounts of base and diluent are flowing through the meters. When the loading lever is pulled, the three-way valves on the base and diluent simultaneously change from recirculation to loading position, and the base and diluent combine in the loading line. The blender maintains the proper proportion of diluent to base. The blended mate-

rial then goes through an orifice line mixer and a loading meter to the truck or tank car being loaded. The blend's temperature and viscosity are recorded.

Blender Operation

The blender comes as a package unit from the manufacturer, consisting of a control cabinet housing the control system and flow meters and control valves plus necessary meter cables, strainers, check valves, etc. The blenders are designed to:

1. Control rate of blending or loading or both.
2. Blend diluent in any proportion up to approximately 95% of the asphalt base.
3. Test blender settings with or without any flow of base or diluent.
4. Check finished blend by means of component totalizers and temperature-corrected meter readings.

The blender automatically maintains a preset temperature-corrected volume ratio of diluent to base stock. In operation, the base asphalt rate is set. Then per cent of diluent required is set. With flow established, the blender maintains the flow rates to give the required finished blend. Note that circulation of both base asphalt and diluent can be set up and maintained at the dock without operation of the blenders.

Blender operating controls are all mounted in the panel, except the set-stop loading meters and the start-stop switches for the base pumps. The latter are located on a separate panel. Each blender has its own asphalt pump. The common suction to these pumps has electrically interlocked valves so that suction may be taken from either one of two large tanks storing 85-100 penetration asphalt which also serves as road-oil base. When valves are in correct position, the OK tank panel light will be on; and with the OK tank placed in service, the recycle lines back to the other tanks will be carsealed. Thus suction and recycle lines are open only to the OK base tank and contamination is prevented.

Three-way valves. Diluent is supplied to each blender from either the RC or MC pump, depending on diluent-selector-switch position. Start-stop stations for the diluent are located below the diluent-pump diagrams. Each blender has a three-way diluent selector valve and a three-way return valve for recycle. These three-way valves are shown on the panel and are operated by the diluent selector switch. Position of these valves is indicated by lights. The motors on these valves are energized through relays, but only when the blend switch is on, or when the test switch is in test position.

On air failure, flow-control valves are wide open. Since the flow is not matching the flow settings, the flow-controller limit switch will put the blender on recycle and the light on the blender will turn off. Loading will start again when air is available and the flows controlled.

"No flow" test run. Before making a blend, the blender is turned on and asphalt flow rate set by control. Next diluent flow is set up (as a per cent of base). The totalizers on both flows are set to zero and total asphalt plus total diluent is read after the blender has operated for 1 minute. The per cent of diluent is then calculated to check proper operation. If a check is obtained, the blender is ready for loading.

Rates and blends are set by the loaders according to charts provided at the docks. With the blender lined up and running, the loader sets the set-stop meter for total gallonage. When the set-stop lever is pulled to load, the blend is started into the truck.

Ticket printing. An important feature of the Kansas City blender operation is the ticket printing system which shows the customer the temperature corrected volumes of base asphalt and cutter stock. In this way, all the information necessary for the customers use is included on the one ticket for simplified record keeping.

As noted, the basic idea was to keep as much of the operation as possible right at the dock. This means less loss of time in the switching of tanks and helps minimize loading-line contamination. It called for close design of the pipe manifold in the center of the dock. This manifold handles transfer of asphalt from all tanks and includes transfer valves on pen asphalt, as well as loading valves. Pen asphalt loading is conventional.

As is well known, especially by those who handle asphalt, setting up of the asphalt is a problem. Therefore the manifold is enclosed in a "hot box." This consists of an angle-iron frame which is insulated and a sheet-metal cover provided. The ends of the plug valves protrude through openings in the cover. A steam coil is provided to keep the piping within this box hot enough to prevent setting up of the asphalt.

In addition, meters and controls must be steam-traced and this is done in the established manner by applying the tracings to the meter body and then a heat-transfer material which is allowed to dry slowly to prevent spalling. Insulation is then applied.

Continuous Viscosity Record

A viscosity recorder is used to check the blend. This is purely a recorder; it has no control connection with the blenders. The instrument selected is one which can be installed directly in the flowing liquid.

Viscosity is measured by exciting a thin alloy blade with an electrical impulse. The blade is on the end of a hermetically sealed sensing probe. Ultrasonic shear waves are produced in the material immediately surrounding the blade. This causes the material to slip back and forth. An electronic computer (part of the instrument) converts the energy required to produce this sliding motion into viscosity measurements on the computer dial or the recording system.

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PETROCHEMICALS— Tops in value and getting bigger

BY T. L. CUBBAGE
Phillips Chemical Co.

• This new division of an old industry now accounts for 57% of the dollar value of all chemicals produced in the U. S.

PETROCHEMICAL production was negligible in 1930, but has now increased to more than 22 million tons per year. These materials presently constitute 30% of all chemicals by volume and are expected to reach a 40% level by 1965. Fig. 1 shows something of the history of the industry over the last 20 years plus a guess at the future.

Of interest is the fact that approximately 3,000 different chemicals are derived from petroleum. Because of the sheer magnitude of this field, this discussion will be limited to relatively small areas of four groups of chemicals which are outstanding in terms of dollar volume and poundage produced. These groups are:

1. Plastics.
2. Synthetic rubber.
3. Aromatics.
4. Ammonia.

Presented at a luncheon sponsored by the Petroleum Activities Committee of the Mid-Continent section of ASME, Tulsa.

Plastics

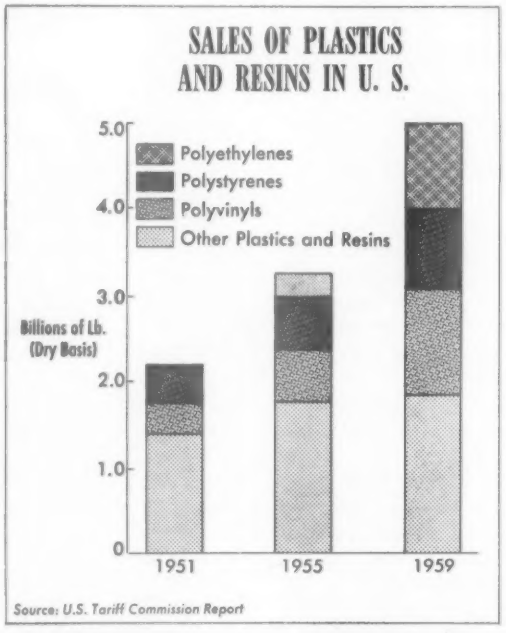
Six industries—appliance, electrical, packaging, automotive, surface coatings, and construction—are the major consumers of plastics, and as can be seen in Fig. 2, three groups of plastics account for the major part of the total consumption. These three—polyethylene, the polyvinyls, and the polystyrenes—are all growing rapidly, particularly polyethylene. In addition to these, an interesting newcomer, which is still too small to show on this chart, is polypropylene. Looking at these groups in some detail we find:

Polyethylene. This is the first "billion-pound" plastic, and it is sparked by developments in pro-

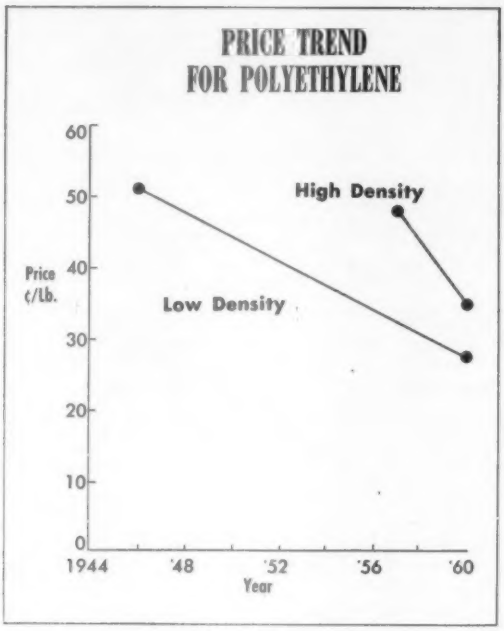
PRODUCTION AND CAPITAL INVESTMENT OF THE U. S. PETROCHEMICAL INDUSTRY

END OF YEAR	ANNUAL PRODUCTION MILLION POUNDS	CAPITAL INVESTMENT MILLION DOLLARS TOTAL	YEARLY
1940	4,000	330	80
1945	10,000	1,000	135
1950	17,000	2,000	215
1955	32,000	4,080	520
1956	35,000	4,600	570
1957	40,000	5,170	800
1958	43,000	5,970	750
1959 (Est.)	45,000	6,720	800
1965 (Est.)	85,000	12,700	

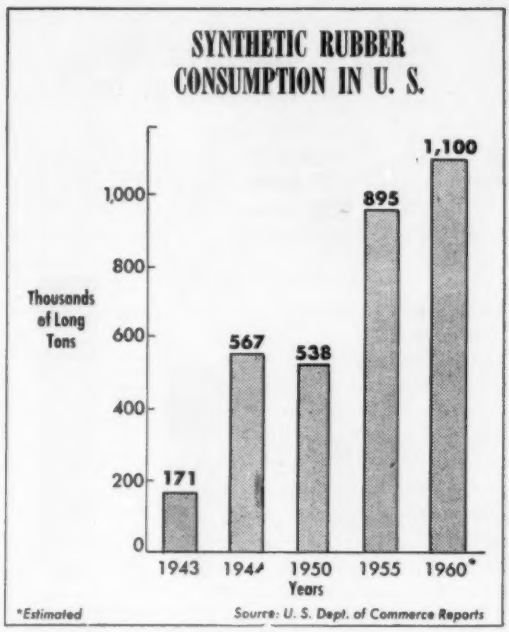
PRODUCTION and capital investment of the U. S. petrochemical industry have more than tripled in the last 10 years. Fig. 1.



POLYETHYLENES, polystyrenes, and polyvinyls account for more than half of the total plastics sales in this country. Fig. 2.



PRICE of high-density polyethylene is rapidly approaching that of the low-density material. Fig. 3.



COMMERCIAL PRODUCTION of polyisopyrene and polybutadiene should help synthetic rubber increase its share of the U. S. rubber market. Fig. 4.

ducing "tailored" or blended resins for specific properties. For example, a film maker who wants more stiffness than provided by low-density polyethylene (PE) and a film which is easier to handle than the high-density PE will specify a tailored or blended resin.

As is well known, a number of types of ethylene homopolymers and ethylene-butene copolymers which vary in physical properties are available commercially. The high-density PE is less flexible, has a higher softening point, and greater tensile strength in general than low-density material.

The high-density-polyethylene segment of this class is important statistically because it is growing so fast. Sales have gone from about 10 million pounds in 1957, the first year in which a significant amount was sold, to an estimated 145 million pounds in 1960. Sales outlook for 1962 is 325 million pounds.

An interesting feature about the growth of the polyethylene market is its price history. Here, as seen in Fig. 3, is a good example, which incidentally is quite common in the petrochemical industry, of what happens to the price of a product much in demand in a free market.

Both low-density and high-density PE producers have expanding markets, and in addition, superior polymers of the high-density type are capturing certain of the low-density PE markets. As a result, there is a trend toward producing a complete range of polyethylene and copolymers tailored to fit the needs of the consumer.

The largest consumer of PE is the film market. New applications include overwraps for textiles, paper products, bread, cigarettes, cigars, etc. Shipping bags are another new use, and there are good possibilities for film use in agriculture.

Injection molding is a leading market for high-density PE, with housewares a big item due to the stiffness, hard glossy surface, and higher heat resistance. Because of low-density PE's flexibility, low cost, and ease of molding, it will retain a portion of the injection-molding market.

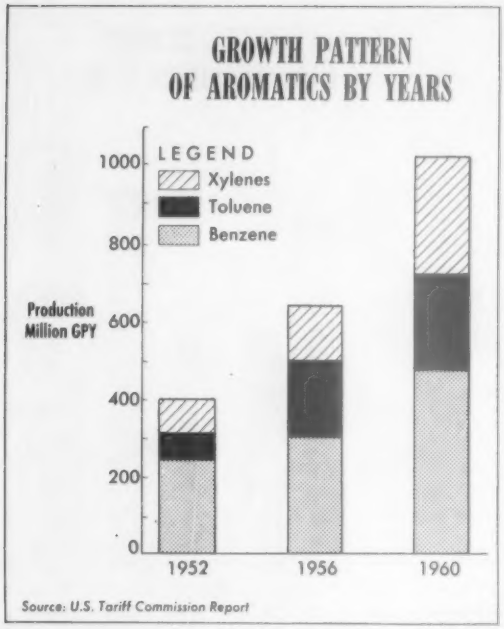
Another market with a big potential is for pipe, but this is currently faced with price and standardization problems. These difficulties should be eliminated in the future, and high-density copolymers should make a large-scale invasion of this field.

Blow molding has been confined to squeeze bottles and tubes of low-density PE; however, rigid bottles and toys from high-density resins may form a major portion of this market in the next year or so. A dependable increase of 12 to 20 million pounds per year is expected in PE use for wire and cable coating, a specialty market which makers of high-density copolymers hope to crack with their superior resins. Most of this business is now held by three low-density producers.

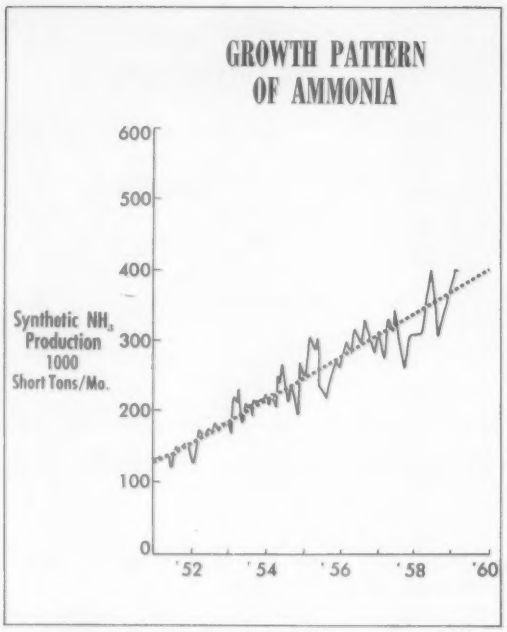
Exports of PE should continue to climb for a short while in the future, but thereafter will probably decline as new overseas production develops.

Vinyl plastics. The principal vinyl plastic (on a quantity basis) is polyvinyl chloride (PVC). Total production for 1960 should go over 900 million pounds compared with something just over a billion pounds for all vinyls. PVC has been well established for over 10 years; and yet, 1959 sales increased 180 million pounds over those of the previous year.

Polyvinyl chloride is manufactured in two general forms—as unplasticized, rigid shapes, and in the form of plasticized, flexible varieties. Incidentally, to show how interrelated this industry is, we need only note that many chemicals used as plasticizers for vinyl resins are petrochemicals themselves.



PETROLEUM-DERIVED aromatics account for more than half of total U. S. basic aromatics production. Fig. 5.



SYNTHETIC-AMMONIA production has increased steadily at an average rate of 13% per year for the last 5 years. Fig. 6.

Consumption of PVC and copolymer in 1959 was approximately 20% in film and sheeting, 35% for molding and extrusion, 18% for flooring, 8% for fabric treatment, 4% for protective coatings, 3% exported and 12% in miscellaneous uses. One of the largest present outlets is wire and cable coating. Other specific end uses include phonograph records, hose, protective coatings, paper and fabric treatment, film, and sheeting.

Vinyl chloride imports are becoming a factor in the business. A recent price drop has resulted in decreased use of the foreign resin; but, the quantity of imported finished goods is rising. Most of the recent growth in vinyl chloride use was in molding and extrusion and in flooring, but every end use grew to some extent. The outlook is for 1½ billion pounds per year by the mid-1960's.

We will see increased usage of vinyl plastics for metal covering to protect surfaces from marring or corrosion, for decoration, noise reduction, and easy cleaning. Vinyl foams show promise, as do uses for unplasticized vinyl in the fields of pipe, tubing, and conduit as well as construction "shapes," such as window frames, sidings, gutters, flashing, and roofing. Vinyl chloride can be expected to take off with increased volume when the right application comes along. Floor coverings are a good example of a take-off end use, and construction may be another—perhaps in the late '60's

Polystyrene. Styrene plastics are approaching the billion-pound per year level. With the styrene market more confined than the broader-based vinyl and PE resins, it has a remarkable record. One important factor has been growth of impact resins, which are made by copolymerizing styrene and synthetic rubber. These newer resins have gone a long way toward dispelling the bad name which polystyrene, and indeed plastics in general, received in the early days of plastics due to some of the unfortunate characteristics of polystyrene by itself.

U. S. sales were about 860 million pounds per year in 1959, up about 140 million pounds over the previous year. In addition, export sales were around 110 million pounds in 1959.

Molding and extrusion materials made up about 75% of the market. Of this 75%, approximately 39% was general purpose, 40% impact, 9% copolymer, and 12% export. Protective coatings for paint and paper was 15% of the total market and the remaining 10% was for other uses. About 12 companies are producing polystyrene. A breakdown of products made from molded and extruded polystyrene shows:

Refrigeration and air conditioning	20%
Appliances, including radio and TV	4%
Packaging	15%
Toys	11%
Housewares	7%
Wall tile	6%
Novelties	3%
Miscellaneous	34%
	100%

Polypropylene. Interest in polypropylene, newest of the large-volume plastics, is running high, with at least 10 companies either in production or talking about producing it in the future. This tremendous activity on the part of producers isn't yet being matched by consumers, and the result promises to be a pretty serious case of overcapacity. For example, capacity in place right now is about 100,000,000 lb. per year, and it's hard to see more than 40,000,000 lb. of sales this year. By 1962, when presently announced expansions are completed, total industry capacity

will be 550 million pounds per year, and 1963 sales are estimated to be 260 million pounds.

Most polypropylene is now used for molding material. Advantages claimed are ease of molding, heat resistance, stiffness, and corrosion resistance. Next largest use is monofilament for rope, cordage, webbing, seat covers, etc. Big markets for the future could include film and fiber. Criticism of polypropylene centers around its brittleness at low temperature and its rapid oxidation. Stabilization of polypropylene to prevent deterioration from exposure to heat and ultraviolet light will be one of the principal keys to its successful application.

Synthetic Rubber

This industry, which was born at the start of World War II, has grown in less than two decades to over 1 million tons annually, as shown in Fig. 4. Two-thirds of the rubber used in the U. S. is synthetic, and the primary user is the tire industry.

As the rubber industry moves progressively from a natural to a synthetic base, the demarcation line between plastics and rubber becomes more vague. The key to improved rubbers lies in the field of polymer chemistry.

Intensive research and development work on synthetic elastomers has resulted in an astonishing proliferation of new polymers for markets of the future. For example, cis-polyisoprene, cis and trans-polybutadiene, ethylene-propylene copolymers, vinyl pyridine rubbers, fluoro rubbers, adduct rubbers, polyurethanes, fluoro and nitrile-containing silicone rubbers, and polyacrylics.

Synthetic rubbers of controlled structure which resemble natural rubber are now entering the commercial-production stage. In this connection, it might be well to recall that what we know as natural rubber is a cis-polymer of isoprene together with small quantities of naturally occurring, but very effective, antioxidants and preservatives. Until recently, natural rubber was superior for uses such as heavy-duty truck tires, but controlled-structure breakthrough in polymer chemistry now threatens this dominance.

Polyisoprene and polybutadiene. Synthetic cis-polyisoprene, by itself, is too pure to be a direct replacement for natural rubber in many applications; that is, it does not contain those trace compounds necessary to make it a completely effective substitute. It is effective, however, when blended with natural rubber. Another closely related product is cis-polybutadiene, which has uses in many areas and is a good extender for natural rubber. The blend of natural rubber and cis-polybutadiene actually has certain properties which are superior to natural rubber. The unusual combination of properties (resistance to abrasion, low heat buildup, and good low-temperature properties) indicates that cis-polybutadiene will be an economical replacement for some current SBR and natural-rubber requirements. Another controlled-structure polymer of interest is trans-polybutadiene, which has certain physical properties that make it suitable for partial use in golf-ball covers. Thus, it can be used in blends of naturally occurring gutta-percha or balata in this application.

Butyl rubber has received a new lease on life from use in an all-butyl tire. Butyl consumption dropped sharply in 1954-56 when tubeless tires were widely adopted for new automobiles, but has gradually enlarged its market in recent years. The reaction of the public to all-butyl tires with claims of quieter, smoother ride should be interesting.

Latex and foam. The battle between latex and polyurethane foams continues. Latex foam has been helped by development of synthetic latexes capable of making 100% synthetic products while polyurethanes have been helped by lower material costs. An unusual application has been suggested—a tire filled with polyurethane foam for freedom from punctures.

Other. Research on elastomers continues, and new rubbers are constantly being developed. High-temperature requirements may be met with aluminum, phosphorous, and boron-containing polymers as well as special silicone rubbers. Fluoro rubbers for improved heat and solvent resistance are coming into the picture as well as adduct rubbers (diene rubber-alkl mercaptan reaction products), polyacrylics and nitrile silicone rubbers for the same purpose.

Aromatics

In this field of petrochemicals, benzene, toluene, and the xylenes are of primary importance. The growth of these petrochemicals is shown in Fig. 5. Production of these three compounds represents about 62% of total U. S. production of basis aromatics.

The chemical industry consumes about half the total production of aromatics as building blocks for more complex end-use compounds. A good example of this situation is found in the manufacture of styrene, where benzene is first alkylated to form ethylbenzene, which in turn is dehydrogenated to make styrene. The styrene is then used in the manufacture of synthetic rubber and in polystyrene plastic. In this way a relatively low-valued petrochemical raw material is upgraded into high-value end-use products. During 1959, 60% of the total U. S. aromatics production was used captively for further upgrading, the remainder being sold to other companies for end uses or for further processing.

Benzene. Of the three large-volume aromatic products, benzene is the largest. Production increases in benzene follow the trend of petrochemicals in general, showing a 14% increase in 1959 and, based on a projection of current data, a 43% increase in 1960. Virtually all benzene produced today is used as a chemical intermediate, with almost 60% of this amount being used in manufacture of styrene and phenol.

Benzene has in recent months been in short supply, and consequently, industry's attention has turned to trying to find methods of relief. Classically, petroleum benzene has been obtained by recovery from aromatic refinery streams. A promising new way, and one which is getting a considerable amount of attention these days, is conversion of either toluene or other branched-ring compounds into benzene by thermal or catalytic treatment in the presence of hydrogen. A number of plants are now being built or planned to use this process.

Toluene. Interest in this route to

ENGINEERING

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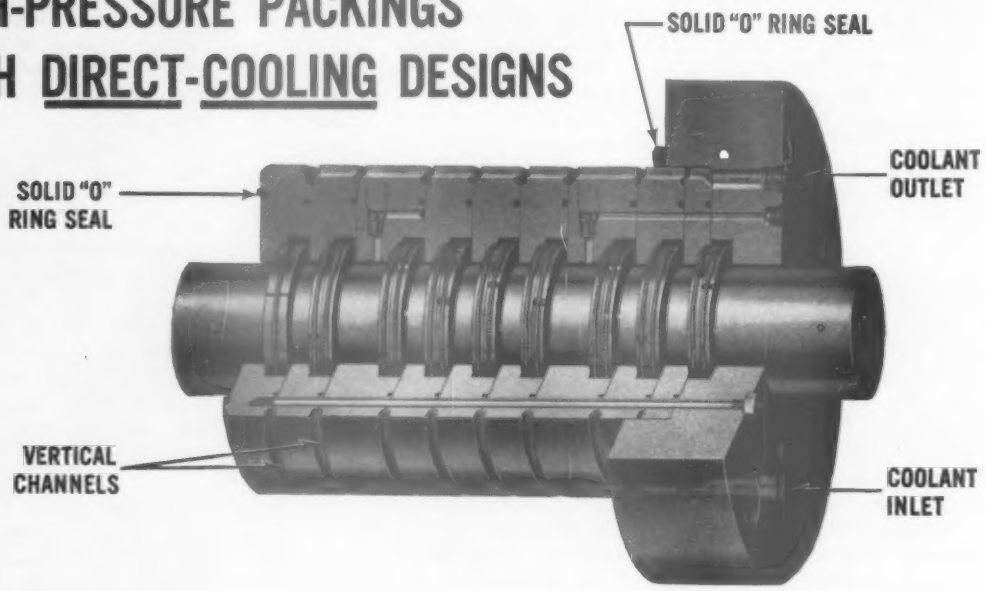

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benzene, which is called hydrodealkylation, has been stimulated by the fact that toluene has been in plentiful supply, and additional capacity is scheduled for the future. To understand the reasons for this supply situation, one must first realize that toluene is obtained in large volumes as a result of modern refining methods such as catalytic reforming. Historically, the big use for toluene has been as an octane improver for aviation gasoline and premium motor fuels. As the jet age progresses, however, demand for aviation gasoline is diminishing and along with it, demand for toluene. Another development, which is just beginning to be felt, is the advent of compact cars. The octane requirement of these vehicles is now lower than that for the majority of full-sized cars, and the result is a temporary lull in the trend toward producing an ever higher percentage of premium motor fuel. Concurrent with decreasing demand in gasoline, solvent uses for toluene, another major outlet, are continuing relatively constant.

Xylenes. The third basic aromatic, xylene, has also shown a rapid growth pattern, with production increasing 43% in the past 2 years. It is primarily used in making motor fuels, aviation gasoline, solvents, and chemical intermediates.

Xylene as a chemical appears to have a bright future. Petroleum xylene streams vary in composition but generally contain about 15% ethylbenzene, 20% orthoxylene, 20% paraxylene, and 45% metaxylene. The ortho, meta, and para isomers can be oxidized to the corresponding dibasic acids (phthalic, isophthalic, and terephthalic) which in turn find their way into alkyd resins, polyesters, films, fibers, plasticizers, dyes, and pharmaceuticals. In many cases ethylbenzene is being separated from the xylene stream and used for the production of styrene.

Orthoxylene is becoming closely tied to the phthalic anhydride market, where it can substitute for the traditional feed stock, naphthalene. Phthalic anhydride is booming these days because of its use in making plasticizers for polyvinyl chloride resins. Demands have outstripped the availability of naphthalene, which is primarily a byproduct of the steel industry, and this has been accentuated by the steel strike plus withdrawal of naphthalene from world markets by Iron Curtain countries. The upshot of all this is a big increase in orthoxylene capacity.

The market for paraxylene which is the basic raw material for terephthalic acid and polyester fibers is currently being threatened by development of a process for making terephthalic from toluene.

Metaxylene has no major chemical use except for isophthalic acid, which currently is still small. Recently, a new film using a blend of tere and isophthalic acids as raw material has been developed. This could be the forerunner of new markets for metaxylene.

Ammonia

The history of U. S. synthetic-ammonia production capacity illustrates another of the growth chemicals in the petrochemical field. As you can see in Fig. 6, synthetic ammonia production has increased steadily. For example, it went from an average of 220,000 short tons per month in 1954 to 364,000 short tons per month in 1959. Percentage-wise this amounts to 65% in 5 years, or a little short of 11% per year.

Fertilizer. The reason for this increase is due primarily to the rapidly expanding fertilizer market. Seventy-six per cent of total ammonia production goes into agriculture, and the remainder is divided among chemicals, explosives, synthetic fibers, and others.

Added fertilizer usage has been encouraged by two major factors. First, the farmer disproved the old bugaboo about the imminence of our running out of arable land. This alarming theme which was preached by agricultural theorists in the 1940's and early 1950's was accepted wholeheartedly by our farmers, and they proceeded to take countermeasures in the form of stepped-up fertilizer usage. The other factor contributing to more ammonia usage has been the Government's soil-bank program, under which marginal land has been retired from service. In their efforts to maintain the same production from the remaining acreage the farmers have used more and more fertilizer. As a tribute to the value of fertilizers, the result has been more food production than ever before from less land. This has been good for the fertilizer producers, but costly to the Government, which of course means it has cost all of us taxpayers. For the future, however, this demonstration of vast food-producing capacity is all to the good, for inevitably, population will catch up and we will need all we can produce.

Storage. An important feature of the agricultural ammonia business is its extremely seasonal nature, with about 70% of annual sales being made in the period March 15 to July 15. This forces the producer to resort to some method of storage. Possible alternatives, all of which are used in varying degrees, are to convert the ammonia to some solid form which can be stored in a pile, store the ammonia underground in a salt cavern, convert it to aqua and store it in atmospheric-pressure tanks, or store it in its anhydrous form. A recent trend in the industry is storage of anhydrous ammonia at low temperature in atmospheric-pressure tanks.

Smaller plants. A new development in the ammonia business, which has been manifesting itself in recent years, is the trend toward smaller plants—150 to 300 tons per day—and located closer to the market. Customer demands for better service have encouraged this relocation, and availability of natural gas from pipelines has made it possible. Many new producers have also gotten into the field. For example, in 1949 there were 14 companies producing ammonia from 19 plants while today 50 companies operate 67 plants. These modern plants are more economical to operate than their predecessors due to improved design and technology. Complete units and compressor sections have been eliminated from the older "classical" type of ammonia processes, resulting in plants with lower investment and lower energy requirements per ton of capacity. With less equipment to operate labor requirements are reduced.

Future markets. There still remain large markets for synthetic nitrogen which as yet are relatively untapped.

Some examples are as follows:

1. Forest fertilizing by airplane. This has been experimented with in Europe and tests indicate the rate of tree growth can be increased 40 to 60%.

2. Fertilization of lakes and ponds. This increased the amount of plant growth in lakes, which in turn has shown a 40% increase in the weight of fish.

3. Erosion prevention. The need for erosion prevention and protection of river banks is pointed up by the muddy water in our rivers plus the fact that Louisiana is getting physically larger every year. Increasing the amount of vegetation along these banks through use of fertilizers will help prevent this waste.

Conclusion

I believe that upgrading is the keystone of this industry. A huge storehouse of petroleum raw materials is available in the U. S., and the industry aim is to upgrade these hydrocarbons wherever economically feasible into higher-valued intermediates and end products. Constantly improving chemical-engineering technology enables the industry each year to do a better and more extensive job of this than it did the year before.

We have to be realistic in our thinking about this upgrading, however, and not be swept away by the romance of converting 1 to 2-cent per pound raw materials into end products worth 20 to 30 times as much. To be successful, a petrochemical venture must have behind it a well-founded research program both to develop new products and to improve upon those already being made. This costs money. Successful companies in this business have also learned that they must anticipate and evaluate unforseen costs and collateral responsibilities that always seem to arise. Producing and marketing a petrochemical will probably involve expenses for:

1. Market research and development.
2. Research on the application of customers' products.
3. Product promotion and advertisement.
4. Distribution and delivery service.
5. Warehousing.
6. Packaging and labeling.
7. Credit and claims settlement.

Another facet of the petrochemical business is competition, which is becoming more intense each year. As mentioned previously, there were 14 ammonia producers in the U. S. in 1949—today there are 50. There now are 230 producers of plastics and over 1,400 producers of paint. American engineers and chemists are particularly good at developing new processes and in building large economical plants which operate on the principle of the continuous process, and as a result, we produce certain basic raw materials, such as ethylene, propylene, butadiene, etc. at quite reasonable cost.

American petrochemical companies are well aware that competitive products can be made economically in Europe and other parts of the world, and that demand for these products will grow. As foreign capacity grows, it will become increasingly difficult to export from the U. S. If an American entrepreneur wants to participate in foreign activities, he must be willing to make some of his investment capital and technical knowledge available abroad. This, of course, is being done both by independent investments and by joint ventures.

In the years ahead, we can expect greater competition both from at home and abroad; however, we are used to operating in a highly competitive industry and are not fearful of these new challenges.

Survey shows drop in iron contamination of cracking catalysts

IRON contamination of cracking catalysts has decreased slightly, according to the current quarterly survey of cracking catalysts. The survey is conducted by Davison Chemical Co.

Data on sodium, however, do not confirm the lower value reported in the previous quarter. Mean value of sodium contamination for August-October 1960 was 521 p.p.m.; for May-July 1960, it was 458 p.p.m.

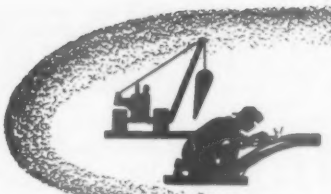
Other metals show no significant change.

This survey marks a significant expansion in the number of units tested. It covers 80 to 90 units now participating in the testing program. The previous report covers 71 of 83 units participating. Davison now analyzes samples from about 55% of U. S. and Canadian fluid-catalytic units.

QUALITY TRENDS IN EQUILIBRIUM FLUID CRACKING CATALYSTS

Period—	Present quarter August-October 1960		Previous quarter May-July 1960		Year ago August-October 1959	
	Mean	Range*	Mean	Range*	Mean	Range*
Activity, D + L	29.3	24.0-34.7	29.2	23.8-34.6	29.6	23.9-35.3
Surface area, $M^2/g.$	118	67-169	119	68-170	118	71-166
Pore volume, cc./g.	0.38	0.25-0.53	0.38	0.25-0.51	....	.....
Apparent bulk density, g./cc.	0.73	0.63-0.84	0.73	0.62-0.84	....	.....
Metal contamination:						
Vanadium, p.p.m.	165	35-791	162	35-755	201	43-935
Nickel, p.p.m.	72	14-369	67	15-314	84	17-407
Copper, p.p.m.	4	0.5-34	3	0.4-31	4	0.4-40
Sodium, p.p.m.	521	69-3,920	458	54-3,856	564	96-3,227
Iron, wt. %	0.34	0.11-1.07	0.36	0.12-1.10	0.37	0.11-1.28

*Ninety-five per cent of fluid units tested fall within these limits.



Monthly Report on PIPELINE CONSTRUCTION

PIPELINE ACTIVITY reported here is compiled from surveys by The Oil and Gas Journal among pipeline companies and construction contractors.

This summary report appears in the last issue of The Journal each month. New construction projects are reported weekly in Pipeline Briefs in the Journal's news section.

Projects are listed in three groups—U. S., Canadian, and Foreign—and according to type of line—crude, products, natural gas, or miscellaneous.

★ The star symbol indicates the first appearance of the project in the Journal's survey.

U. S. Crude Oil Pipelines

BELL OIL & GAS CORP., Tulsa, Okla.
★ Project: 12-mile, 8-in. crude oil line from Hewitt to Ardmore, Okla.
Completion: July 1, 1961.

CONTINENTAL PIPE LINE CO., Drawer 1267, Ponca City, Okla.
Project: 4 miles of 3-in., 18 of 4-in., 68 of 6-in., 323 of 8-in., and 53 of 10-in., in new Glacier Pipe Line System from Cutbank, Mont., to Byron, Wyo.
Status: Under way.
Contractor: R. H. Fulton & Co., Lubbock, Tex.
Completion: July 5, 1961.
★ Project: 20.7 mile, 8-in. crude line from Grand Isle to Golden Meadow, La.
Completion: Dec. 31, 1961.
Contractor: Glaser Construction Co.
★ Project: Gathering system in Prairie Creek field of Campbell and Crook counties and Bertha field, Campbell County, Wyoming, and 18 mile, 4-in. transmission line to connect with Belle Fourche system at Miller Creek.
Status: Application before Wyoming PSC.

GILLETTE PIPELINE, INC., and A. W. HARTWIG, INC.
Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.
Status: Pending Wyoming Public Service Commission approval.

GREAT NORTHERN PIPE LINE CO., 175 East 4th St., St. Paul 1.
Project: 64-mile extension of system northwestward to the Lignite field, Burke County, North Dakota.
Status: Planned for 1961.

LAFITTE OIL TRADERS, INC., Bartlesville, Okla.
★ Project: 9-mile, 4-in. Grand Coulee gathering system, Acadia Parish, La.
Completion: June 1961.

MATADOR PIPE LINE CORP., Denver.
Project: 175-mile line from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man.
Status: Pending approval of Canadian National Energy Board.

MESA PIPELINE CO., Midland, Tex.
Project: Extension of gathering system to other fields in West Texas and southeastern New Mexico.
Status: Planned.

MID-AMERICA PIPELINE CO., Skelly Building, Tulsa.
Project: 405-mile, 10-in. condensate line from Superior, Wis., to Chicago. It would connect at Superior with the trunk line of Lakehead Pipe Line Co., eastern division of Interprovincial Pipe Line Co. Shipments would be fed into Interprovincial from gathering lines now under consideration in Alberta.
Status: Proposed.

MID-CONTINENT PIPE LINE CO., Tulsa, Okla.
★ Project: 9-mile, 6-in. crude oil line from Crider field to Maysville station, Okla.
Status: Planned.

NORTHWESTERN REFINING CO., Box 248, St. Paul Park, Minn.
Project: 4, 6, and 8-in. gathering lines in Glenburn field, Renville and Bottineau counties, North Dakota.
Status: Has state approval.

OVERLAND PIPELINE INC., Wichita, Kans.
★ Project: 4-in. gathering system in Lone Tree field, Wyo., and transmission line to connect with Plains Pipeline Division of Franklin County Coal Corp.
Status: Application before Wyoming PSC.

PHILLIPS PIPE LINE CO., Bartlesville, Okla.
Project: 75-mile 6-in. main line and 85 miles of 4-in. gathering lines to handle crude and condensate, linking Camrick field, Oklahoma, to the Phillips, Tex., refinery.
Completion: Mid-1961.

ROCK ISLAND OIL & REFINING CO., INC., 321 West Douglas Ave., Koch Building, Wichita 2, Kans.
Project: 60 miles of 6 and 7-in. from fields in Red Willow County, Nebraska, to Arapahoe Pipe Line's Colby, Kans., station.
Status: Under way.
Contractors: Gilmore Construction Co. Hays, Kans.; Plains Construction Co., Kimball, Neb.; and Barney Bridges Ardmore, Okla.
Completion: Spring 1961.

SERVICE PIPE LINE CO., Tulsa, Okla.
★ Project: One 16-in. and two 12-in. crossings, Arkansas river at Keystone reservoir, near Tulsa, Okla.
Contractor: Williams Brothers.
Completion: April 1, 1961.
★ Project: 60-mile, 12-in. crude line, La Plata, Mo., to Wood River, Ill.
Completion: June 1, 1961.

SHAMROCK PIPE LINE CORP., Box 631, Amarillo, Texas.
★ Project: Gathering system in Hansford-Ochiltree counties, Texas, for Hansford (Marmaton), Twin (Des Moines), Share (Morrow) and Horizon (Cleveland) fields, 57 miles, 3, 4, and 6-in.
Completion: May 1, 1961.

TETON PIPE LINE CORP., 1700 Broadway, Denver 2.
Project: 45 miles of 6-in. gathering and transmission line in Dead Horse Creek, Barber Creek, and Sussex fields in Campbell and Johnson counties, Wyoming, to connect with Service Pipe Line Co. facilities at Sussex.
Status: Approved by Wyoming Public Service Commission.

U. S. Products Pipelines

BUCKEYE PIPE LINE CO., 30 Broad St., New York 4.
Project: 42 mile 8-in. txtension of Midwest products system from Flint to Bay City, Mich.
Status: To start spring 1961.
Completion: August 1961.

CARL M. LOEB, RHOADES & CO., 42 Wall St., New York 5.
Project: 75-mile, 20-in. line from New Jersey refineries to Long Island and its two big airports, Idlewild and La Guardia.
Status: Study being made by Gulf Interstate Co., Houston.

DIXIE LPG PIPE LINE CO., (organized by Warren Petroleum Corp., Phillips Petroleum Co., Union Texas Natural Gas Co., and Tuloma Gas Products Co.), 800 Enterprise Building, Tulsa.
Project: 1,100-mile,, 8 to 10-in. propane line from the Houston area to Raleigh, N. C.
Status: Service Pipe Line Co., Tulsa, selected as design and construction agent. Construction may start first quarter 1961.
Completion: Fall 1961.

EL PASO NATURAL GAS CO., El Paso, Texas.
★ Project: 58-mile, 6 in. LPG line from Jal, N. M., extraction plant to El Paso Natural Gas Products Co. refinery at Odessa, Texas.
Status: Planned.

GREAT LAKES PIPE LINE CO., Kansas City, Mo.
★ Project: Conversion of 6-in. products lines from Des Moines, Iowa, to Minneapolis and to Chicago area to tie-in with Northern Gas Products LPG line from Bushton, Kans.
Status: Planned.

HUMBLE PIPE LINE CO., Box 2220, Houston.
Project: 11 miles of 4-in. LPG line from Baytown to Mont Belvieu, Tex.
Status: Planned.
Completion: June 1961.

NORTHERN GAS PRODUCTS CO., Omaha, Neb.
★ Project: 350-mile, 8-in. LPG line from Bushton, Kans., extraction plant to Des Moines, Iowa, where it will connect with Great Lakes 6-in. lines to Twin Cities and to Chicago area.
Status: Planned.

SOUTHERN PACIFIC PIPE LINES, INC., 65 Market St., San Francisco.
Project: 70-mile 8-in. jet-fuel line from Stockton to Castle Air Force Base near Atwater, Calif.
Contractor: Eastern Pipeline Contractors, Dallas.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1.

PIPELINE CONSTRUCTION

Project: 290-mile LPG line between South Louisiana and Mont Belvieu, Tex.
Status: Planned.

TRANS-SOUTHERN PIPELINE CORP. (subsidiary of Transcontinental Gas Pipe Line Corp., Box 296, Houston).
Project: 1,000 miles of 8 to 12-in. LPG line from Mont Belvieu, southeast of Houston, to Sanford, N. C., with spurs to Demopolis, Ala.; Hattiesburg, Miss.; and an area south of Baton Rouge.
Status: To start laying pipe March 1961.
Completion: By August 1961.

WEST SHORE PIPELINE CO. (Stock owned by Pure Oil Co. and Interstate Oil Pipe Line Co., a subsidiary of Standard Oil Co. of New Jersey).
Project: 200-mile line from Chicago to Milwaukee and Green Bay, Wis., with main line possibly 16-in. and laterals 12-in.
Status: Proposed. The line has backing of 10 oil companies.

YELLOWSTONE PIPE LINE CO., Ponca City, Okla.
★ Project: 82-mile, 6-in. products line from Helena to Great Falls, Mont.
Completion: Dec. 1, 1961.
Contractor: R. H. Fulton & Co.

U. S. Natural Gas Pipelines

ALABAMA-TENNESSEE NATURAL GAS CO., Box 380, Florence, Ala.
Project: 3½-mile, 6-in. line to serve Armour Agricultural Chemical in Colbert County, Alabama.
Status: Planned.

ALAMO GAS SUPPLY CO., Alamo National Building, San Antonio.
Project: 166 miles of 20, 22, and 24-in. line and 101 miles of 12, 16, and 24-in. line from Texas Gulf Coast to San Antonio.
Status: Projected.

ALASKA PIPE LINE CO., Houston, Tex.
Project: 74 miles from Kenai Unit gas field to Anchorage.
Status: Construction suspended until spring 1961.
Project: Extension of Kenai-Anchorage line to Fairbanks.
Status: Alaska Pipe Line Co. has ordered economic and engineering studies to determine feasibility of such a proposal.

ALGONQUIN GAS TRANSMISSION CO., 25 Faneuil Hall Square, Boston 9, Mass.
Project: 30 miles of line in Massachusetts.
Status: Approved by FPC.

ARKANSAS WESTERN GAS CO., Box 405, Fayetteville, Ark.
Project: New lines from Altus, Coal Hill, and Rock Creek fields to the main system.
Status: Approved by Arkansas Public Service Commission.

BORDER GAS TRANSMISSION CORP. (owned by Lehman Brothers, New York investment firm, and Rio Gas Gathering Co., 615 National Bank of Commerce Building, San Antonio 5, Tex.).
Project: Gathering lines in Starr, Zapata, Jim Hogg, Brooks, and Webb counties, Texas.
Status: Proposed.
Project: Gathering lines in Dimmit, Zavala, and La Salle counties, Texas.
Status: Proposed.

CITIES SERVICE GAS CO., Box 1995, Oklahoma City 1.
Project. 10½ miles of 8-in. to connect Rounds and Porter plant with main line in Marion County, Kansas.
Status: Planned.
Project. Gathering lines in Sterling field, Comanche County, Oklahoma.
Status: Pending FPC approval.

COASTAL STATES GAS PRODUCING CO., 200 Petroleum Tower, Corpus Christi, Tex. (Subsidiaries include Lo-Vaca Gathering Co. and South Texas Natural Gas Gathering Co.).
Project: 330 miles of various size pipe from Three Rivers area to southeast Lavaca County, Texas.
Completion: April 1, 1961.

COASTAL TRANSMISSION CO., Houston, Texas.
★ Project: 71 miles of various size laterals in Florida.
Status: Approved by FPC examiner.

COLORADO GAS TRANSMISSION CO., Colorado Springs, Colo.
★ Project: 20-inch natural gas line, approximately 250 miles, from Ignacio-Blanco area, southwest Colorado, to Walsenburg, Pueblo and Colorado Springs, Colo.
Status: Application before Colorado PUC.

COLORADO INTERSTATE GAS CO., Box 1087, Colorado Springs.
Project: 7 miles of 20-in. in Texas Panhandle.
Status: Pending FPC approval.
Completion: 1961.
Project: 109 miles of 26-in. from Texas Panhandle to southeastern Colorado; 134 miles of 34-in. from there to Pueblo, and 107 miles of 30-in. on to Denver.
Completion: 1961.
Project: 155 miles of 34-in. from Rock Springs, Wyo., to Provo, Utah, to connect with El Paso's proposed 395-mile line to California.
Status: Approved by FPC.
Completion: 1963.
Project: 32 miles of 6-in. from Central Colorado to Trinidad.
Status: Pending FPC approval.

COLORADO OIL & GAS CORP., Denver.
Project: 402-mile line from Gubik field to Fairbanks, Alaska.
Status: Proposed.

COLORADO-WYOMING GAS CO., Box 480, Denver 1.
Project: 16½-mile, 16-in. transmission line in Adams and Boulder counties, Colorado.
Status: Pending FPC approval.
★ Project: 2-mile, 4-in. gas line from main-line system to Niwot, Colo.
Status: Planned.

COLUMBIA GAS SYSTEM, INC., 120 East 41 St., New York 17.
Projects: Eight loops totaling 96.9 miles, 30-in. in Kentucky, Tennessee, Mississippi and Louisiana, plus 29 miles of 12-in. gathering line from near Houma, La., to the Texaco Dog Lake field.
Status: Planned.
Completion: 1961.

COLUMBIA GULF TRANSMISSION CO., Box 683, Houston 1.
★ Project: 9½ miles, 10-in. gathering line, Marguerite to Ivanhoe, La.
Status: Underway.
★ Project: 0.9 mile, 6-in. gathering line in Terrebonne Parish, Louisiana.
Status: Under way.
Project: 97 miles of main-line loop in Kentucky, Tennessee, Mississippi, and Louisiana, and 29 miles of 12-in. lateral supply lines in Louisiana.
Status: Pending FPC approval.
Completion: 1961.

EAST TENNESSEE NATURAL GAS CO., Knoxville, Tenn.
★ Project: Carthage laterals, 10.1 miles, 4-in. to South Carthage, Tenn., and Monterey lateral, 13.4 miles, 6-in. to Pleasant Hill, Tenn.
Status: Planned.

EL PASO GAS SUPPLY CO. (subsidiary of El Paso Natural Gas Co., Box 1492, El Paso).
Project: 228 mile, 30-in. line from Live Oak County to Sonora in Sutton County.
Status: Pending FPC approval.

EL PASO NATURAL GAS CO., Box 1492, El Paso, Tex.
Project: 52 miles of 20-in. transmission from new plant in Terrell County to a line connection in Pecos County, Texas, plus 23 miles of various-size field line.
Status: Approved by FPC.
Project: 119 miles of 30-in. Permian-San Juan crossover loop.
Status: Pending FPC approval.
Completion: 1961.
Project: 17 miles of 30-in. near Spokane, Wash.
Status: Pending FPC approval.
Completion: Not known.
Project: 34 miles of 20-in. from Puckett tie-in to Goldsmith, Tex.
Status: Pending FPC approval.
Completion: 1961.
Project: 23 miles of 20-in. from Goldsmith to the Eunice-Plains line, and 395 miles of 34-in. from Thistle, Utah, to near Las Vegas, Nev.
Completion: 1961.
Project: Loop on the San Juan mainline, involving 27½ miles of 34-in.
Status: Pending FPC approval.
Completion: Not known.
Project: About 228 miles of 30-in. from Coquat to Sonora, Tex.
Status: Pending FPC approval.
Completion: Not known.

EQUITABLE GAS CO., 420 Boulevard of the Allies, Pittsburgh, Pa.
Project: 15 miles of 16-in. in Monongalia County, West Virginia, and Greene County, Pennsylvania.
Status: Approved by FPC.
Completion: October 1961.
Project: 6 miles of 20-in. in Greene County, Pennsylvania.
Status: Approved by FPC.
Completion: October 1961.
Project: 17 miles of 20-in. in Greene and Washington counties, Pennsylvania.
Status: Approved by FPC.
Completion: October 1962.

HOUSTON TEXAS GAS & OIL CORP., Box 10400, St. Petersburg 33, Fla.
Project: 235 miles of various size laterals in Florida.
Status: Approved by FPC examiner.

KENTUCKY-WEST VIRGINIA GAS CO., Pittsburgh, Pa.
★ Project: 9.8-mile, 8-in. gathering system, Knott County, Kentucky.
Completion: By June 30, 1961.

LONE STAR GAS CO., 301 South Harwood St., Dallas 1.
Project: 14½-mile, 8-in. connection of the company's system to Pure Oil's gasoline plant in Caddo field, Oklahoma.
Status: Planned.
★ Project: 51.2 miles, 18-in. gas line from Parker County to Palo Pinto County, Texas.
Status: Under way.
Completion: Before June 30, 1961.
★ Project: Gathering lines, 6.3 miles 16-in. in Bratch County, 16.5 miles of 8-in. and 11.6 miles of 6-in. in Palo Pinto County, 23.3 miles of 8-in. in King County and 7.6 miles of 8-in. in Smith County, Texas.
Status: Under way.
Completion: Before June 30, 1961.

LO-VACA GATHERING CO. (see parent company, Coastal States Gas Producing Co.)

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PIPELINE CONSTRUCTION

CO., Union Trust Building, Pittsburgh 19, Pa.
Project: 10½ miles of 24-in. Washington-ton and Beaver counties, Pennsylvania.
Status: Planned.
Completion: September 1961.

MISSISSIPPI RIVER FUEL CORP., 407 North 8th Street, St. Louis 1, Mo.
Project: 5 miles of 16-in. and 15 miles of 12-in. from Collinsville, Ill., to St. Jacob, Ill.
Status: Pending FPC approval.

MONTANA-DAKOTA UTILITIES CO., Minneapolis, Minn.
★ Project: 106-mile, 12-in. natural gas line from Minot, N. D., to Bismarck.
Status: Before FPC.
Completion: September 1, 1961.

MONTANA POWER CO., Box 1338, Butte, Mont.
Project: 16-in. line from Carway, Alta., to Cut Bank, Mont.
Completion: 1961.

MOUNTAIN FUEL SUPPLY CO., Salt Lake City, Utah.
★ Project: 94.3-mile, 20 in. gas line with Natural Gas Co. from Uinta basin to near Provo, Utah.
Status: Planned.

MUSTANG FUEL CORP., Oklahoma City, Okla.
★ Project: 75 miles, 4½ through 12¾-in. between Piedmont and Oakwood, Okla.
Completion: June 1961.
★ Project: 17 miles, 10¾-in. through 12¾-in. from Newcastel to Crider, Okla.
Completion: June 1961.

NATURAL GAS PIPELINE CO. OF AMERICA, 122 South Michigan Avenue, Chicago.
Project: 50 miles of 20-in. laterals and 4.5 miles of 6-in. laterals to connect with existing 26-in. system in Jim Wells County, Texas, plus 33 miles of 10-in. laterals in the Normanna area.
Status: Temporary FPC approval.
Project: 347 miles of 8, 30, and 36-in. loop and gathering line at various locations between Texas and Illinois.
Status: Pending FPC approval.
Completion: 1961.

NORTHERN NATURAL GAS CO., 2223 Dodge St., Omaha 1, Neb.
★ Project: 11.5 miles 30-in.; 62.7 miles, 16-in. and 1.2 miles, 4-in. to serve towns of Silver Bay and Two Harbors, Mich., and Reserve Mining Co., Silver Bay.
Status: Conditionally approved by FPC.
Project: 1,100 miles of laterals:
116 miles, 2-8 in. to 20 Minnesota towns. Contractor, Davis Construction Co.
136 miles, 2-8 in. to 26 Minnesota towns. Contractor, Harbert Construction Co.
426 miles, 2-19 in. to 62 Iowa towns. Contractor, R. H. Fulton & Co.
130 miles, 2-8 in. to 25 Iowa and Nebraska towns. Contractor, Shamrock Construction Co.
176 miles, 2-8 in. to 29 Iowa, Nebraska, South Dakota towns. Contractor, Brodie Construction Co.
116 miles, 2-8 to 15 Minnesota, South Dakota towns. Contractor, R. E. Reutzel Co.
Status Approved by FPC.
Completion: September 1, 1961.

OHIO FUEL GAS CO., Columbus, Ohio.
★ Project: 24.6 miles replacement program, 5.7 miles 12-in. to Medina and Lorain counties, 4.5 miles, 12-in. near Zanesville, 8.4 miles 12-in. in Holmes, Tuscarawas, Carroll and Stark counties, 1 mile 8-in. in Madison County and 2.5 miles, 18-in. in Meigs, Athens and Hocking counties, Ohio.
Status: Planned.

OKLAHOMA NATURAL GAS CO., Tulsa, Okla.
★ Projects: 5-mile, 12-in. line near Oklahoma City, 15 mile, 8-in. line near Eufala and 5-mile, 12-in. line near Ponca City.
Completion: Before May 1, 1961.

PACIFIC GAS & ELECTRIC CO., 245 Market St., San Francisco.
Project: 67 miles of line from Kettleman Hills to Morro Bay, Calif.
Project: 120 miles of 34-in. looping of Topock-Milpitas main line.
Status: Planned. Pending FPC approval.
Completion: 1963.
Project: 291 miles of 36-in. from the California-Oregon border to Antioch, Calif. (Part of a 1,400-mile project to move Alberta gas to San Francisco.)
Contractor: H. C. Price Co., Bartlesville, Okla. (Bechtel Corp. San Francisco, is the engineering manager.)
Status: Under way.
Completion: System will be in use during 1961-62 winter season.

PACIFIC GAS TRANSMISSION CO. (Pacific Gas & Electric Co., San Francisco).
Project: 611 miles of 36-in. from the Canadian border at Eastport, Idaho, to the California border near Klammath Falls, Ore. (Part of a 1,400-mile project to move Alberta gas to San Francisco.)
Contractors: Western Pipe Line, Inc., Austin, Tex., and J. P. Neill & Co., Dallas, have contracts for the 465-mile southern portion. H. C. Price Co., Bartlesville, Okla., has contract for the 146-mile northern portion from Rosalia, Wash., to Eastport, Idaho. (Bechtel Corp., San Francisco, is the engineering manager.)
Status: Under way.
Completion: The system will be in use during the 1961-62 winter season.

PACIFIC LIGHTING GAS SUPPLY CO., Los Angeles, Calif.
★ Project: 24-mile, 16-in. gas line from Gaviota to Goleta, Calif.
Completion: August 1961.

PAN AMERICAN GAS CO., Box 591, Tulsa.
Project: 50-mile system from Pan American's terminal at Texas City to Pasadena and La Porte.
Status: Under way.

PANHANDLE EASTERN PIPE LINE CO., 120 Broadway, New York.
★ Project: Gathering lines, 3.85 miles of 4-in. and 3.44 miles of 6-in. in Oklahoma and 1.87 miles of 4-in. and 1.01 miles of 6-in. in Kansas.
Project: 298 miles of 30-in. loops, 43 miles of 16 to 26-in. supply laterals, and 80 miles of 6 to 12-in. sales laterals.
Status: Pending FPC approval.

PHILLIPS PETROLEUM CO., Bartlesville, Okla.
Project: 16 miles of 2 to 8-in. gathering line in Eddy County, New Mexico.
Status: Planned.
Project: 17 miles of 4 to 10-in. gathering line in Midland County, Texas.
Status: Planned.

PIONEER NATURAL GAS CO., Amarillo.
Project: 21 miles of 12-in. from Sudan to Muleshoe, Tex.
Status: Pending FPC approval.
Project: 12 miles of 10-in. from Muleshoe, Tex. northward.
Status: Pending FPC approval.

PUBLIC SERVICE CO. OF NORTH CAROLINA, Gastonia, N. C.
Project: 17½ miles of 14-in. between Stem and Roxboro, N. C.
Status: Under way.

RIO GRANDE VALLEY GAS CO., Brownsville, Tex.
★ Project: Transmission line extensions in Hidalgo County, Texas; 6.2 miles, 6-in.; 2.9 miles, 8-in.; and 1.3 miles, 12-in.
Completion: April 1961.

SOUTHERN CALIFORNIA GAS CO., and SOUTHERN COUNTIES GAS CO. OF CALIFORNIA, Los Angeles.
Project: 150-mile line across southern California from the Nevada border to the Los Angeles basin. Line would connect with a proposed El Paso Natural Gas Co. line extending to Rock Springs, Wyo.
Status: Pending approval of State Public Utilities Commission of California.

SOUTHERN UNION GAS CO., Fidelity Union Tower, Dallas 1. and **EL PASO NATURAL GAS CO.,** Box 1492, El Paso.
Project: 60-mile line from El Paso's main line near Holbrook, Ariz., to paper mill under construction near Snowflake.
Status: Planned.

SOUTH GEORGIA NATURAL GAS CO., Box 791, Thomasville, Ga.
★ Project: 2.5 miles of laterals to serve Sylvester and Ocilla, Ga.
Status: Approved by FPC.

ST. LAWRENCE GAS CO., Ogdensburg, N. Y.
Project: 75 miles of line from Cornwall, Ont., to Ogdensburg, N. Y.
Status: Approved by FPC.

TENNESSEE GAS PIPELINE CO., a division of Tennessee Gas Transmission Co., Box 2511, Houston 1, Tex.
★ Project: 7.2 miles, 8-in. gathering line, Louisiana.
Status: Under construction.
Completion: Spring 1961.
Contractor: Houston Contracting Co.
★ Project: 16.8 miles, 12-in. gathering lines, offshore Louisiana.
Status: Approved by FPC.
★ Project: 12.4 miles, 12-in. gathering lines, offshore Louisiana.
Status: Approved by FPC.
★ Project: 9.8 miles, 10-in. gathering lines, offshore Louisiana.
Status: Pending FPC approval.
★ Project: 20.6 miles, 12-in. gathering lines, offshore Louisiana.
Status: Pending FPC approval.
★ Project: 13 miles, 20-in. gathering lines, offshore Louisiana.
Status: Pending FPC approval.
★ Project: 6.4 miles, 12-in. gathering lines, offshore Louisiana.
Status: Pending FPC approval.
Project: 15 miles of 12-in. gathering line offshore Louisiana.
Status: Pending FPC approval.
Project: 11½ miles of 16-in. offshore Louisiana.
Status: Pending FPC approval.
Project: 158 miles of 36-in. loop lines at various points between Kinder, La., and Centerville, Tenn.
Status: Approved by FPC.
Project: 166 miles of 36 and 30-in. loop lines at various points in Ohio and Pennsylvania.
Status: Pending FPC approval.

TENNESSEE GAS TRANSMISSION CO., Box 2511, Houston.
Project: For proposal to carry Texas gas to California via a 1,100-mile 30-in. line through Mexico, see Foreign Natural Gas listing.
Project: 292-mile line from the California-Mexican border to Los Angeles to tie in with above-mentioned line across northern Mexico.
Status: Tennessee Gas's subsidiary, California Gas Transmission Co., and Southern California Edison Co. have filed applications with California Public Utilities Commission. Also pending FPC approval.
Completion: July 1962.
Project: A line from producing fields in

Photo courtesy of Coast Paint & Lacquer Company, Houston

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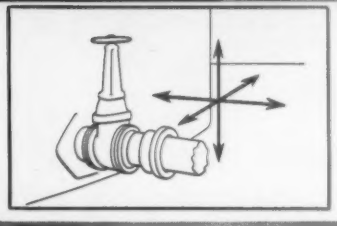
Left—Cross-section shows construction of Barco Flexible Ball Joint.



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PIPELINE CONSTRUCTION

Texas to the Mexican-Texas border, which would connect with proposed line through northern Mexico to California.
Status: Tennessee Gas has formed a Texas subsidiary, Tennessee California Gas Transmission Co., to build and operate the Texas segment.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1.
Projects: 165 miles of 20-in. from West Monroe, La., to Kosciusko, Miss.; 128 miles of 30-in. loops from there to Lambertville, N. J.; and 37 miles of laterals in New Jersey.
Status: To be handled by next winter.
Project: 144 miles to be built in 1962.

TEXAS GAS TRANSMISSION CORP., Box 577, Owensboro, Ky.
Projects: 146 miles of new line including 6, 26, and 30-in. loops in Kentucky, Tennessee, Mississippi, Louisiana, and Indiana, and 50 miles of 8 and 16-in. to connect five fields in Terrebonne Parish, Louisiana.

TRANSCONTINENTAL GAS PIPE LINE CORP., 3100 Travis St., Houston, Tex.
Project: 15 miles of 36-in. main-line loop to bypass reservoir of Cowan's Ford hydroelectric project on North Carolina's Catawba River.
Project: 7 miles of 16-in. in New Jersey.
Status: Pending FPC approval.
Completion: 1961.
Project: 31 miles of 30-in. in Texas.
Status: Pending FPC approval.
Completion: 1961.
Projects: 36-in. as follows: 33 miles in Louisiana, 22 in Mississippi, 62 in Alabama, 39 in Georgia, 22 in South Caroline.
Status: Pending FPC approval.
Completion: 1961.

TRANSWESTERN PIPELINE CO., 618 First City National Bank Building, Houston 2, Tex.
Project: Gathering system in West Texas and Panhandle areas, 6 miles, 12-in.; 7 miles, 10-in.; 20 miles, 8-in.; 125 miles, 6-in.; 195 miles, 4-in..
Status: Under way.
Completion: December 1961.
Contractor: Sheehan Pipe Line Construction Co.
★ Project: 10-mile, 4-in. line from El Mar gasoline plant to West Texas lateral.
Status: Under way.
Completion: April 15, 1961.

TRUNKLINE GAS CO., Box 1642, Houston.
Project: 42.2 miles 30-in. loops between Louisiana and Illinois.
Status: Under way.
★ Project: 76 miles, 26-in. from Longville to Cow Island, La.
Status: Planned.
Project: 52 miles of 20-in. from Bayou Sale to Cow Island, La.
Status: Pending FPC approval.

UNITED GAS PIPE LINE CO., Box 1407, Shreveport 92, La.
★ Project: 22.37 miles, 24-in. line between Magnet-Withers and Missouri City, Tex.
Status: Under way.
Completion: May 1961.
Project: 217 miles of 30-in. from St. Mary Parish to near Monroe, La.
Status: Pending FPC approval.
Completion: Late 1961.
Project: 59 miles of 36-in. purchase lateral connecting Bastian Bay field, Louisiana.
Status: Pending FPC approval.
Completion: Fall 1961.

WASHINGTON GAS LIGHT CO., 1100 H St., NW, Washington 5, D. C.
★ Project: 10.99 miles, 16-in. gas line near

PIPELINE CONSTRUCTION

Lanham, Mo., and Lanham to Belair, Md.
Completion: September 1961.
★ Project: 20.66 miles various size distribution lines, Belair, Md.
Completion: September 1961.
★ Project: 15.5 miles, 24-in. gas line at Hybla Valley, Va.
Completion: October 1961.
Project: 16 miles of 24-in. from near Alexandria, Va., to Prince Georges County, Maryland.
Status: Approved by FPC.

WESTERN SLOPE GAS CO., Denver, Colo.
★ Project: 7-mile, 4-in. gas line from Powell Park field to Meeker, Colo.; 4-mile, 4-in. line from Section 11T7SR94W to Rifle, both to be completed by July 15, and 6 miles of 4-in. gathering lines to be completed by September 1.

U. S. Miscellaneous Pipelines

LINDE CO., a division of Union Carbide Corp., 270 Park Ave., New York 17.
Project: 8-mile pipeline to deliver oxygen from new oxygen and nitrogen plant on the Houston Ship Channel to Arco Steel and Diamond Alkali.
Completion: 1961.

MONSANTO CHEMICAL CO., 800 North Lindbergh Blvd., St. Louis 66.
Project: 25-mile lines to move petrochemicals between proposed plant at Chocolate Bayou and Texas City.
Status: Planned.

SUNOLIN CHEMICAL CO., 1608 Walnut St., Philadelphia 3.
Project: Ten 8-in. chemical lines from SunOlin's ethylene-oxide plant under construction at Claymont, across the Delaware River to a point north of Penns Grove, N. J.
Status: Planned. To start this spring.
Completion: By late 1961.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1.
Project: 350 miles of 24-in. coal-slurry line to move West Virginia coal to electric companies in Pennsylvania, New York, and New Jersey. (Texas Eastern is working jointly with Consolidation Coal Co., Pittsburgh, Pa.)
Status: Proposed.
Completion: Possibly in 1962.

Canadian Crude Oil Pipelines

BITUMINOUS OIL PIPELINE CO. (Royalite Oil Co., Ltd., Royalite Building, Calgary.)
Project: A 250-mile line from Athabasca oil sands to Edmonton.
Status: Proposed.

HUDSON'S BAY OIL & GAS CO., LTD., 320 7th Ave. W, Calgary, Alta.
Project: 41 miles of 4 and 8-in. condensate line from the Waterton-Castle River area and Pincher Creek field in southwestern Alberta to Carway near the international border. The new line would then connect with Continental Pipe Line's Glacier crude system in Montana and Wyoming.
Status: Pending approval. (Hudson's plans new company, Aurora Pipe Line Co., to operate line.)

MATADOR PIPE LINE CORP., Denver.
Project: 175-mile line from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man.
Status: Proposed. (See U. S.)

MID-CONTINENT PIPE LINES, LTD., Edmonton, Alta.
Project: 1,500 miles of 30-in. from Ed-

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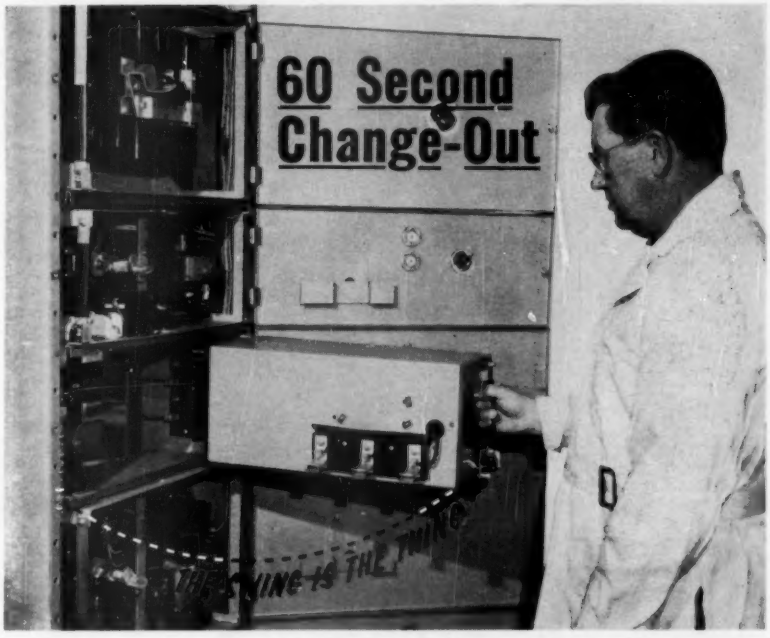

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PIPELINE CONSTRUCTION

monton to Chicago. U. S. section to be owned by International Oil Pipeline Corp., New York City.
Status: Pending Canadian Board of Transport Commission approval. W. C. Gilman & Co., New York City, has made preliminary study.

RANGELAND PIPE LINE CO., Calgary.
Project: 111-mile line from Cessford field to Calgary.
Status: Pending approval of Alberta government.

TRANS-PRAIRIE PIPELINES, LTD., 12912 125 Ave., Edmonton, Alta.
Project: Expansion of gathering system in British Columbia will include 40 miles of 4-in. from Taylor to Dawson Creek; 30 miles of 6-in. from Boundary Lake to Taylor; 75 miles of 8-in. from Taylor to Milligan Creek, 11 miles of 4-in. from Milligan Creek to West Beaten; and 4 miles of 8-in. near the Taylor station.
Status: Under way.
Contractor: Banister Construction Co., Ltd., Edmonton.
Completion: By fall of 1961.

WESTERN PACIFIC PRODUCTS & CRUDE OIL PIPELINES, LTD., 1155 West Georgia St., Vancouver 5, B. C.
Project: 500-mile, 12-in. line to carry crude and liquids from Taylor, B. C., to Kamloops where it will connect with the Trans Mountain line to Vancouver.
Status: Under way.
Completion: Late 1961.

Canadian Products Pipelines

BRITAMOIL PIPE LINE CO., LTD., Box 130, Calgary, Alta.
Project: 126-mile 6-in. line from Pincher Creek to Calgary.
Status: Pending approval of the Alberta Oil and Gas Conservation Board.
Project: 64-mile 8-in. line from Dick Lake to Edmonton, Alta.
Status: Pending approval of the Alberta Oil and Gas Conservation Board.

FOOTHILLS PRODUCTS PIPE LINE LTD., (Pembina Pipe Line Co., Mannix Co., Ltd.), Calgary, Alta.
Project: 1,300 miles of 16-in. from Alberta to Chicago.
Status: Proposed. Standard Oil Co. (Ind.) will participate in the project.

HUGHENDEN PIPELINE.
Project: 125 miles from Dick Lake gasoline plant to underground storage in the Hughenden region of easter Alberta.
Status: Pending approval of Alberta Oil and Gas Conservation Board.

HYDROCARBONS PIPELINE, LTD., 239 Sixth Ave., SW, Calgary, Alta.
Project: 503-mile, 4 to 12-in. gathering system, with deliveries to Calgary, Innisfail, Hughenden, and Interprovincial Pipe Line Co.
Status: Pending approval of Alberta government.

PROVINCIAL PRODUCTS PIPELINES, LTD.
Project: 700 miles of 4 to 12-in. line to pick up propane, butane, and condensates from natural-gas plants in Alberta for delivery to refineries and other plants.
Status: Pending approval of Alberta Oil and Gas Conservation Board.

WESTALTA PRODUCTS PIPELINE, LTD., (Pembina Pipe Line, Ltd., Edmonton, Alta).
Project: 885-mile 4 to 16-in. gathering system to take natural-gas liquids from plants in Alberta for delivery to proposed Foothills trunkline to Great Lakes area.
Status: Pending approval of Alberta Board of Public Utility Commissioners. Standard Oil Co. (Ind.) will participate in the project.

Canadian Natural Gas Pipelines

ALBERTA GAS TRUNK LINE CO., LTD., Calgary.
Project: 226 miles of 36-in. and 125 miles of 30-in., plus laterals in southern Alberta including 58 miles of 22-in. and 64 miles of 16-in. (This is part of a 1,400-mile system to move Alberta gas to San Francisco.)
Contractors: Majestic Contractors, Ltd., Edmonton, has 113 miles of 36-in. from Crowsnest Pass to Priddis, 63 miles of 30-in. from Rocky Mountain House to Cynthia, and 38 miles of 22-in. lateral to the Rimbey region. Mannix Co., Ltd., Calgary, has 113 miles of 36-in. from Priddis to Rocky Mountain House. Dutton-Williams Brothers, Ltd., Calgary, has 62 miles of 30-in. from Cynthia to near Whitecourt, Alta., as well as a 20-mile, 22-in. lateral to the Whitecourt area. Piggott Construction, Ltd., Edmonton, has 64 miles of 16-in. lateral from Crowsnest Pass to Carway, Alta., on the U. S. border.
Completion: To be in use during the 1961-62 winter season.
Projects: The following laterals will be built in 1961 to tie in with the above mentioned 1,400-mile project from Alberta to San Francisco: 15 miles of 12-in. to Buck Lake, 23 miles of 22-in. to East Calgary, 15 miles of 16-in. to Carstairs, 4 miles of 8-in. to Sarcee, and 10 miles of 10-in. to Wildcat Hills.

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PIPELINE CONSTRUCTION

Other laterals to be built in the future will connect Kaybob, Berland River, Lovett River, and Stolberg.

ALBERTA NATURAL GAS CO., LTD. (Pacific Gas & Electric Co., San Francisco, and Westcoast Transmission, Calgary.)

Project: 108 miles of 36-in. from Crowsnest Pass across southeastern British Columbia to the U. S. border near Eastport, Idaho. (This is part of a 1,400-mile project to move gas from Alberta to San Franctsco.)

Contractor: Price-Poole of Canada, Ltd. (Canadian Bechtel, Inc., Toronto, is engineering manager.)

Completion: The system will be in use during the 1961-62 winter season.

CANADIAN INDUSTRIAL GAS, LTD. (formerly Ajax Petroleums, Ltd.), Derrick Building, Calgary, Alta.

Project: 28 miles of 10-in. and 4 miles of 8-in. from Morinville to Westlock Viking Sand field.

Status: Planned.

Completion: By September 1961.

CARTIER GAS CORP. (St. Maurice Gas Inc., and Consumers Gas Co., 19 Toronto St., Toronto).

Project: Transmission and distribution in eastern townships and through to Quebec City in Quebec Province.

Status: Proposed.

GAS TRUNK LINE OF BRITISH COLUMBIA, LTD., Pacific Bldg., Calgary.

Project: 245-mile, 30-in. extension of Westcoast Transmission system from Taylor, B. C., to Fort Nelson.

Status: Planned. May possibly get under way early 1962.

MAGNA PIPELINE CO., LTD., Nanaimo Vancouver Island, B. C.

Project: 53 miles of parallel 7-in. reinforced plastic pipe to serve Vancouver Island, B. C.

Status: Approved by British Columbia Public Utilities Commission.

Completion: 1963.

NORTHERN ALBERTA PIPE LINES, LTD., Edmonton, Alta.

Project: 110-mile trunk line, plus gathering system, from Lac La Biche, in McMurray vicinity, to Edmonton.

Status: Pending provincial approval.

ONTARIO NATURAL GAS STORAGE & PIPELINES, LTD., Chatham, Ont.

★ Project: 14 miles, 10-in., 7 miles, 4-in. transmission line from Waterloo to Fergus, Ont., and 63 miles, 2-6-in. distribution lines.

Completion: August 1961.

QUEBEC GAS TRANSMISSION LINES, INC., 1610 Sherbrooke St. W., Montreal.

Project: 300-mile line from Montreal to Quebec City.

Status: Seeking pipeline franchise from Quebec provincial government.

SARATOGA PROCESSING CO., LTD., 406 Petroleum Building. Calgary.

Project: 16-in. line from Savanna Creek field, Alberta, to a planned processing plant near Coleman.

Status: Pending approval.

WESTCOAST TRANSMISSION CO. LTD., Calgary.

Project: 688-mile, 30-in. loop of British Columbia-Washington line.

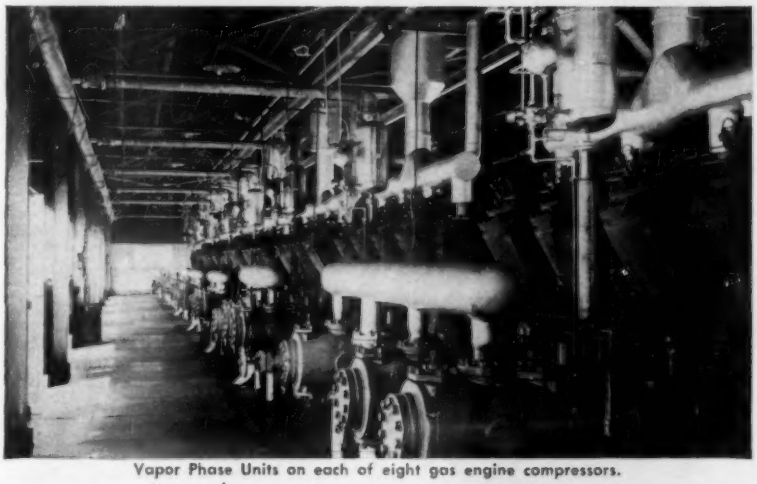
Status: Proposed.

Project: (See Alberta Natural Gas Co., Ltd., for joint project).

Foreign Crude Oil Pipelines

ABU DHABIE MARINE AREAS, LTD. (partly owned by British Petroleum

VAPOR PHASE® PUTS ENGINE HEAT TO WORK, CUTS FUEL AND EQUIPMENT COSTS AT TIDEWATER'S VENTURA PLANT



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Engines were cooled by large radiators with fans, driven by separate multiple cylinder gas engines.

Gas-Fired Oil Heaters were used to separate water and sludge from crude oil.

Therefore Tidwater had the cost of additional engines and fuel to cool compressors, plus fuel cost to heat oil.

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AFTER VAPOR PHASE® INSTALLATION

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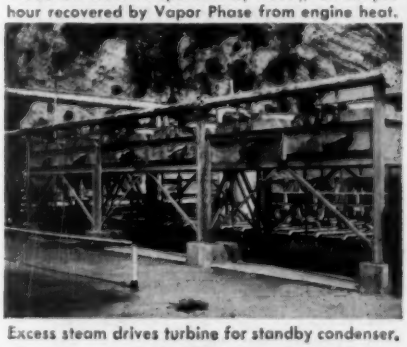
4. Gas-Fired boiler is eliminated.
5. 4,000 pounds of steam per hour heats the crude oil to separate water and sludge from oil.
6. Excess steam is used to heat the workmen's locker room and to drive a steam turbine for the standby condenser-engine cooler.
7. Engine maintenance is reduced.



Excess steam drives turbine for standby condenser.

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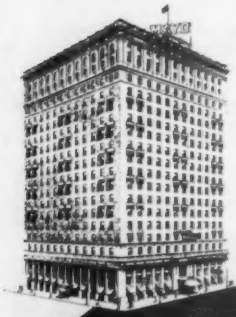

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PIPELINE CONSTRUCTION

Co., Britannic House, Finsbury Circus, London E.C. 2).
Project: 20 miles of 18-in. from offshore Persian Gulf pool to Das Island.
Completion: 1962.

ALGERIAN LINE.
Project: 330-mile line from Ohanet field to Hassi Messaoud field where it would connect with existing line to Bougie seaport in Algeria. Eventually, the system would extend southeasterly from Ohanet field to Edjele field, which is presently served with a line to the La Skhirra seaport in Tunisia.
Contractors: First 140 miles of the Ohanet-Hassi Messaoud line will be laid by SOCOMAN, with completion by June 1961. Remainder of the Messaoud-Ohanet line will be built by GREP.

ALGERIAN LINES.
Project: 75-mile 10-in. line to link the new oil field, El Gassi-El Agreb, with the existing Hassi Messaoud-Bougie line. SNPA is field operator.
Status: Planned.
Project: 340-mile line from Ohanet field to the Hassi Messaoud system.
Status: Approved by French Council of Ministers.

BARNABO GROUP (Italian interests).
Project: A line from Venice, Italy, to Innsbruck, Austria, which could then be extended to Munich, Germany.

COUNCIL FOR MUTUAL ECONOMIC AID (Comecon).
Project: 2,800-mile system from the Volga-Ural oil fields in Russia to East Europe satellite countries.
Status: Construction under way in Poland, Hungary, and Czechoslovakia. Construction in Russia to start soon.

ENI (Italian state oil agency) and ITALO-SWISS FINANCE CO.
Project: A 700-mile system from Genoa to Aigle, Switzerland, thence northeast to the German border, where it would split with one branch going to Munich and another branch to the Karlsruhe area. Feeder lines would go to Turin, Milan, and Cremona, Italy.
Status: The trunk line from Genoa to Aigle approved by the Italian Government.

ENI (Italian state oil agency).
Project: Line from Trieste to Ingolstadt, Bavaria, with possible branch from Carnic in western Austria, to Vienna.
Status: Being discussed.

ESSO STANDARD (LIBYA), INC.
Project: 100 miles of 30-in. from Zelten field to Gulf of Sirte.
Status: Under way.
Contractor: Arabian Bechtel Corp.
Completion: Mid-1961.

GERMAN LINE planned by eight German refining and marketing companies (British Petroleum, Esso, Deutsche Erdoel, Shell, Gelsenberg-Benzin, Mobil, Schloven-Chemie, and Wintershall).
Project: 155-mile, 24-in. line to Bavaria from Karlsruhe.
Status: Planned.

IRANIAN OIL EXPLORATION & PRODUCING CO.
Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bander Mashur line.
Status: Planned.

IRAQ PETROLEUM CO., LTD., 214 Oxford St., London W 1.
Project: Looping of Kirkuk-Mediterranean system is under way on a 66-mile stretch between K-1 and K-2 stations and on an 81-mile stretch between K-3 towards the Syrian border. In Syria, a 28-mile section of 30-in. is under way

MENE GRANDE OIL CO., Apartado 709, Caracas.
Project: 16-in. line at Block 11, Maracaibo.
Completion: December 1961.

OASIS OIL CO. OF LIBYA, 539 South Main St., Findlay, Ohio. (Other participants are Esso Sirte and Libyan American Oil Co.)
Project: 86 miles of 30-in. from the Dahra area of Libya to El Sider on the Mediterranean Coast, and 36 miles of 20-in. feeder line from the Mabruk area to the 30-in. line.
Status: Planned.

OIL INDIA, LTD. (Burmah Oil Co. and Assam Oil Co., two-thirds, and India Government, one-third).
Project: 720 miles of line in northeast India. This will include 250 miles of 16-in. from Nahorkatiya to Noonmati and 470 miles of 14-in. from Noonmati to Barauni.
Contractors: Mannesmann, a German firm, and SAIPEM, a member of the ENI group.
Status: Under way.
Completion: The 16-in. system is scheduled for completion late 1961.

PETROLEO BRASILEIRO S.A. (Brazil).
Project: 250-mile line from Rio de Janeiro to Belo Horizonte refinery site.
Status: Under consideration.,
Project: 35 miles of 8 to 12-in. pipe from Buracica to Candeia.
Contractor: Techint, Inc., Milan, Italy.
Project: 80 miles of 24-in. to tie in to proposed Caxias refinery near Rio de Janeiro.
Status: Planned.

PHILLIPS PETROLEUM CO., Bartlesville, Okla.
Project: 14-in. line in Block 17, Lake Maracaibo, Venezuela.

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PIPELINE CONSTRUCTION

Status: Planned.
Contractor: Chicago Bridge & Iron Co.

ROYAL DUTCH-SHELL.
Project: 12-mile line from Gore Bay, Australia, to Royal Dutch-Shell's Clyde refinery.
Status: Planned.
Project: 161 miles 20-in. line from Tandzung field to Balikpapan refinery, Borneo.
Status: Planned.
Contractor: Williams Brothers Overseas, Ltd., Tulsa, and John Brown, Ltd., London.
Completion: January 1, 1962.

SOUTH EUROPEAN PIPELINE CO. (Jersey Standard, Caltex, Shell, British Petroleum, and 12 other firms.)
Project: 419 mile 30-in. line from Lavera, near Marseille, to Strasbourg, with 40-mile extension to Karlsruhe, Germany. This may be extended into lower Batavia with a 155-mile, 22-in. segment.
Status: Under way.
Completion: 1963.

SYRIAN LINE.
Project: About 320 miles of 6-in. from interior of Syria to link Homs refinery with various fields.
Status: Under way.
Contractor: The Italian firm, Techint.
Completion: In 1962.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields in Bashkiria to Irkutsk.
Status: Under way.
(See Council for Mutual Economic Aid for information on new East Europe line.)

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 390 miles of 14-in. from fields in Neuquen Province, Argentina, to Bahia Blanca.
Status: Under way.
Project: 625 miles of 12-in. from Mendoza to San Lorenzo.
Status: Planned.

Foreign Products Pipelines

ARABIAN AMERICAN OIL CO., Dhahran, Saudi Arabia, and 505 Park Avenue, New York.
Project: 37 miles of 8-in. LPG line from Abqaik to 'Ain Dar.
Contractor: Aramco-Bechtel.
Completion: 1961.

CIE. FRANCAISE DE PETROLES, Paris, France.
★ Project: 187-mile, 8-in. condensate line from Hassi R'Mel dehydration plant to Haoud-el-Hamra station on Hassi Messaoud-Bougie crude oil line.
Status: Under way.

INDIA GOVERNMENT.
Projects: 600-mile line across northern India from Barauni to Delhi via Kanpur. Lucknow, and Allahabad; 300-mile combination crude and products line from Bombay to Bhusaval; 120-mile products line from Bombay to Poona to be extended 300 miles, later, to Hyderabad; and a 350-mile products line from Cochin to Madras via Bangalore.
Status: Proposed. Recommendation has been made to start work on three of the systems immediately, with completion in 5 years. The fourth system would be started in 1963. Which might be built first was not disclosed.

NATIONAL IRANIAN OIL CO., Teheran.
Project: 520 miles of 8-in. from Rey to Meshed, Iran.
Status: Under way.
Contractor: Williams Brothers, Tulsa.

NORTH ATLANTIC TREATY ORGANIZATION (Bid details from Bureau of Foreign Commerce, U. S. Department of Commerce, Washington.)
Project: 57 miles of 8-in. in Germany to Land Baden-Wuerttemberg air field.
Project: 93 miles of 6-in. in Turkey.

PETROLEOS MEXICANOS, Avenida Juarez 92-94, Mexico City.
Project: 500-mile line from Minatitlan to Mexico City.
Status: Planned, with construction starting in 1961.
Completion: 12 to 18 months after construction starts.
Project: 270 miles of 8-in. from Torreon to Chihuahua.
Status: Under way.
Completion: September 1961.

PIPELINES OF PUERTO RICO, San Juan.
Project: 95 miles 8-in. from Penuelas to Catano.
Status: Approved by Puerto Rican Public Service Commission.

SYRIAN PIPELINE.
Project: About 310 miles from Homs to tank farms in the Damascus, Aleppo, and Latakia areas.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 2,315 miles of 29-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields in Bashkiria to Irkutsk.
Status: Under way.
Project: 700 miles from Novo-Kuibyshev refinery to Bryansk.
Status: Under way.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 652 miles of 10-in. from Lujan de Cuyo to Buenos Aires.
Status: Planned.

Foreign Natural Gas Pipelines

BASRAH PETROLEUM CO., LTD., 214 Oxford St., Oxford Circus, London W. 1, England.
Projects: 65 miles of 12 to 16-in. line from Zubair to Fao, Iraq.
Contractor: Mothercat Co., Ltd., Beirut, Lebanon.
Completion: April 1961 for line to Fao.

GASES NATURALES DE COLOMBIA, S.A. (Owned 50% by Colombian Petroleum Co., which is affiliated with Mobil International and Texaco, and 50% by local interest.)
Project: 140 miles of 10-in. from Cicuco field to the Caribbean port of Barranquilla.
Completion: Late 1961.

INDIA.
Project: India plans to start formal talks with Pakistan soon concerning possibility of importing natural gas from Sui field into India.
Status: Preliminary studies indicate a pipeline to Bombay might be commercially sound.

INTERNATIONAL GAS CO., Los Angeles, Calif.
Project: 1,840-miles, 30-in. gas line from Reynosa to Mexicali via Monterrey, Mazatlan, etc.
Status: Proposed.

ISRAEL GOVERNMENT and private interests.
Project: 75 miles of 16-in. to power a plant at Ashdod Yam on the Mediterranean Coast.
Status: Planned.

NIOGAS.
Project: 82 miles of 8 and 10-in. to connect Traismauer and Amstetten in Austria.
Contractor: Williams Brothers, Tulsa.

PAKISTAN INDUSTRIAL DEVELOPMENT CORP.
Project: 1,000-mile system to carry gas from Sui field northward from Multan to Lyallpur, Lahore, Daudkhel, Islamabad, Rawalpindi, and Wah. This would require a loop to an existing 310-mile 16-in. line from the Pakistan petroleum field to Multan.
Status: Under consideration. Technical survey has been ordered.

PAKISTAN PETROLEUM CO.
Project: 145 miles of 8-in. from Sylhet field to Daccq, East Pakistan.
Status: Proposed.

PETROLEOS MEXICANOS, Avenida Juarez 92-94, Mexico City.
Project: A 500-mile northward extension of the newly completed gas line from Ciudad Pemex to Mexico City. It would extend to Queretaro, Salamanca, San Luis Potosi, and Guadalajara.
Status: Planned.
Project: 270 miles of 12-in. from Torreon to Chihuahua.
Status: Under way.
Completion: September 1961.
Project: For proposed Texas to California line through Mexico, see Tennessee Gas listing below.

SOC. SICILIANI METANDOTTI (SOSIM). Partners include Edison Power, Italcementi, Fiat Motor, Sicilian SGES Power, Bombrini Parodi Delfino Chemical, and Montecatini.
Project: 560 miles from Hassi R'Mel gas field, Algeria, to Cape Bon, Tunisia, 77 miles across the Sicilian Channel, into northern Italy and beyond.
Status: Engineering studies under way.

SOTHRA.
Project: A 315-mile system from Hassi R'Mel gas field in Algeria to the Mediterranean Coast, including 262 miles of 24-in. trunk from Hassi R'Mel to Relizane and 20-in. from Relizane to Arzew, plus branches to Oran and Algiers.
Status: Under way.
Contractors: Groupement Entrepose-Ste. Parisienne pour l'Industrie Electrique (GREP) has contract for 200 miles from Hassi R'Mel to Tiaret. Socoman has contract for 115 miles from Tiaret to Arzew.
Completion: Spring 1961.

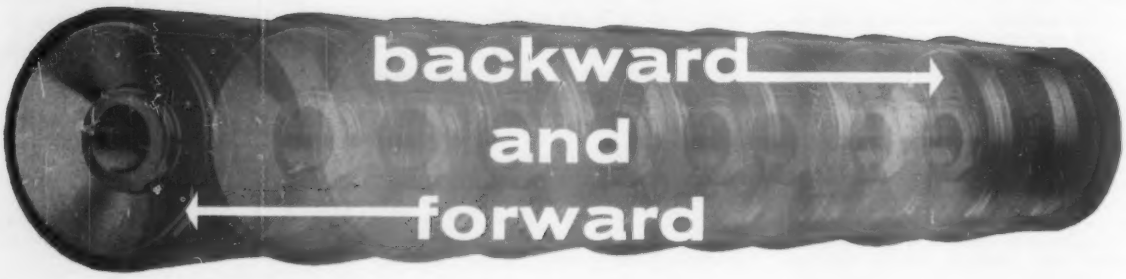
STANDARD-VACUUM OIL CO., New York.
Project: 60 miles of 8-in. from Radja field to Palembang, Sumatra, to supply fertilizer plant planned by the government.
Status: Planned.

TEIKOKU OIL CO. and **TOKYO GAS CO.**
Project: These two companies are negotiating a proposed 200-mile, 12-in. system to move gas from Kubiki gas field in Japan.
Status: Proposed.

TENNESSEE GAS TRANSMISSION CO., Box 2511, Houston.
Project 1,100-mile, 30-in. line from Reynosa, near the southern tip of Texas, across Mexico to San Luis Rio Colorado, near the California border.
Status: Agreement signed by Petroleos Mexicanos and Tennessee Gas Transmission. Pemex would own the Mexican portion of the system. Pending FPC, California PUC approval.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 1,050-mile line from Comodoro Rivadavia to Buenos Aires with a spur to Plaza Huincul field in Neuquen province. Line will be 26 in. to the connecting point for the Plaza Huincul link and 30 in. from the connection to Buenos Aires.
Status: Proposed.

Look at It



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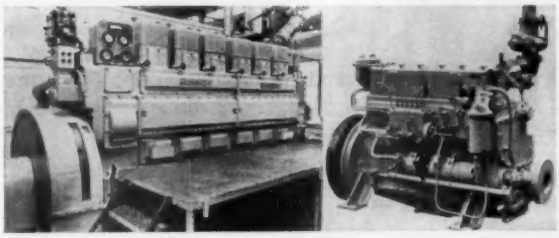
▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Two dual-fuel engines



. . . recently announced by a Netherlands manufacturer are designed to operate on both liquid fuel and on combustible gas to which a small amount of diesel fuel is added. The engines come, respectively, in two horsepower ranges: high-speed, 47 to 140 hp.; and heavy-duty, 150 to 500 hp.

When the engines operate on gas fuel, a lean gas-air fixture flows into the combustion chamber under pressure. The mixture is kept lean enough to require the addition of a small quantity of diesel fuel for ignition.

The engines have a compression ratio of 14-to-1. According to the maker, this provides equal efficiency under both operating systems. Source: **Kromhout Motoren Fabriek, N.V., Netherlands Trade Commission, 10 Rockefeller Plaza, Suite 1123, New York 20, N. Y., U.S.A.**

Up to 2,000 meter charts processed

. . . daily with this new chart-processing system, the maker says. The Electroscanner system can scan an orifice-meter chart, compute, print, and punch a card every 15 seconds. With the new instrument, an unskilled operator in 8 hours can integrate the same number of charts 12 highly skilled operators can do manually.

The instrument electronically processes all types of orifice flow charts. An operator keys into the electronic code memory the chart identification. While one chart is scanned, the next chart can be keyed in. At the end of the chart scan, the operator releases both the identification number and the integration into the card-punch system. One revolution of the chart produces 400 optical scans per chart. The digital extension for each of the 400 measured scans is individually computed by the digital computer.

In turn, the computer electronically substitutes the digital value for the analog value of each scan. The chart extension formula is applied and accumulatively entered into the accumulator. The accumulator retains the accumulatively computed total for the scanned chart. At the end of one chart revolution, the integration in the accumulator and the identification number in the code memory are released to the card-punch system. Source: **UGC Instruments Div. of United Gas Corp., P. O. Box 1407, Shreveport, La., U.S.A.**

•

Tubingless-completion tools

. . . in a new line have been announced. Components of the line include a Type AH packer which is claimed to eliminate left-hand rota-

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Product name, Model no., literature title or number: .....

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tion of tubing while setting or releasing. Available with or without hydraulic hold-down slips, the packer features a one-piece mandrel and ring type of packing elements. The maker says it can be set, released, and reset without affecting the packer's efficiency.

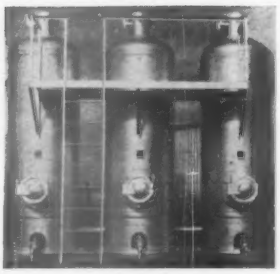
Other components of the new line are a Type RLO tubing safety joint that features a friction ring which is said to facilitate easy release, available with either a right or left-hand break connection, and a tubing centralizer designed for easy installation which is said to permit running multiple strings of tubing individually.

The line also includes a double-box tubing landing collar, tubing wiper plug, and a male type of drillable tubing guide shoe. Source: **Texas Iron Works, P. O. Box 16068, Houston 22, Tex., U.S.A.**

●

Gas-sweetening vessels

. . . in a new line are on the market for use where concentration of hydrogen sulfide is below 50 grains per hundred cu. ft. The Sweco units



use the iron oxide method of passing gas through a bed of iron sponge. The three units illustrated have a combined capacity of 7 M.M.c.f.d. with a concentration in the gas of 10+ grains of hydrogen sulfide per 100 cu. ft. of gas at a working pressure of 500 psi.

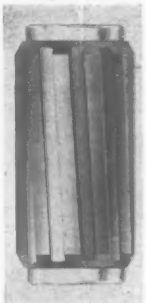
The units are claimed to require no pumps, towers, heaters, water, or power source, thus minimizing and maximizing site choice.

According to the manufacturer, this type of vessel is also useful to clean gas that still retains some mercaptans after it has passed through an amine plant, for cleaning gas used in chemical processes where expensive catalysts are used, and as standby equipment for existing liquid-purification plants.

The units can be installed in one day and require attention only three or four times per year, the maker claims. They come in capacities to 25 M.M.c.f.d. and for working pressures to 1,000 psi. Source: **Southwest Equipment Co., Prudential Bldg., Houston, Tex., U.S.A.**

●

Jacketed sucker-rod coupling



. . . can be obtained now which is designed to reduce wear on couplings and tubing while reducing frictional drag in the well. The Nyoglide coupling has a thermoplastic jacket molded securely on its outer diameter. The jacket has spiral flutes on a 15° helix angle for complete coverage of the tubing surface with no impedance of the fluid flow. The jacket is said to retain its physical properties at temperature up to 550° F. Source: **Liberty Mfg. Co. of Texas, 4025 Hempill, Fort Worth, Tex., U.S.A.**

"Curses! There's COLMONOY hard surfacing everywhere!

Even on **NEW** *washpipes!"*

The Colmonoy Spraywelder applies powdered nickel-base alloys smoothly and quickly. Overlays are fused and ground.

Washpipes in hydraulic jarring tools take about the worst "wear and tear" of any oil field equipment. That's why Bowen Itco, Inc., hard surfaces its washpipes with Colmonoy No. 6. Colmonoy overlays resist corrosion/abrasion, do not gall, have a low coefficient of friction—thus provide oil field parts (new or old) with longer life.

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Metal cuttings removed from mud

. . . quickly and efficiently with this Model E ditch magnet, the maker says. It is installed in the drilling-mud system between the shale shaker and the working pits. As mud flows through it, the magnet automatically removes metal particles.

The unit contains a permanent magnet electrically rotated to discharge steel cuttings from the unit's side. Adjustable wings at the unit's entrance direct mud flow through the housing in which the magnet is suspended. Adjustment of the escape hatch controls mud flow. Source: **K & G Oil Tool & Service Co., Inc., 2703 Sackett, Houston 6, Tex., U.S.A.**

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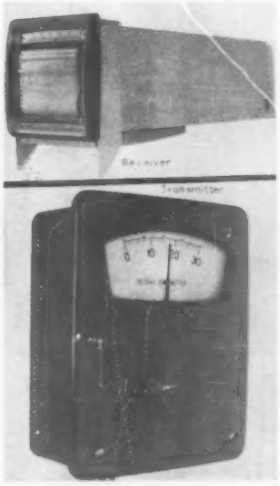


Transistorized telemeter system

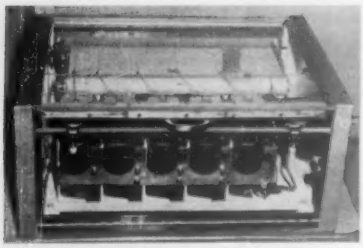
. . . offers cycles of 2 seconds or less, the maker reports. The standard 2-second cycle provides high scanning speed. The system has few moving parts, and no mechanical cam followers, clutches, or mercury switches.

The transmitter features a photodiode detector which scans input position in relation to a cam etched on glass and operates sealed dry-switch contacts in the transmission system.

The receiver features plug-in components and a transistorized amplifier. The maker says it is insensitive to supply-frequency changes. When the telemeter system operates, the position input from the measuring element in a pipeline is converted at the transmitter to a switch closure. The duration of closure is proportional to the measurement. The transmitter switch closes the circuit through a transmission link to the receiver. This energizes the receiver for an equal period of time. The receiver converts the time period into a record or an indication of measurement.

Any of the three transmission links may be used to connect instruments several hundred miles apart by leased telephone or private two-wire lines, power lines, or audio frequency or microwave channels.

A choice of transmitter and receiver enclosures is available. Source: **Foxboro Co., Foxboro, Mass., U.S.A.**



Well-logging, drilling package

. . . available for rental in the U.S.A. and for purchase elsewhere is designed to automatically record and compare, by time, six drilling functions, detect and chromatographically analyze gas shows, and log drilling time.

The three principal instruments in the package are (1) a six-channel recorder, (2) gas detector and analyzer, and (3) a strata log. The recorder, called a Caddygraph (Complete Automatic Drilling Data Yeoman), automatically records rotary speed, hook load, mud-pit level, pump pressure, mud-gas analysis, and drilling or penetration rate. It plots the curves simultaneously side by side on 18¾-in. graph paper at the rate of 3 in. per hour. It thus gives a complete chronological record of a well from spud date to completion date, both going in and coming out of the hole.

The gas detector and analyzer serves both as an antomatic hot-wire monitor of mud gases and a chromatographic analyzer of gas shows. It both qualitatively and quantitatively indicates the over-all gas concentration and individual percentage concentrations of methane, ethane, propane, and others.

The strata log records drilling time by electromechanical means. Calibrated in depth instead of time units, it is claimed to make unnecessary the construction of an additional log for comparison with an electric log. Automatically, it plots a time strip. The strip includes elapsed time of each foot drilled, shutdown, and trip time, with adjustable time scales.

Six-foot sections of the recorder log can be removed after each 24-hour drilling tour, notations made on trips, and then sent along to interested persons. Source: **Caddygraph, Inc., 319 Airport Dr., Shreveport, La., U.S.A.**

●

Tubing anchor-packer

. . . is claimed to simplify production operations and eliminate problems common to tubing anchors and packers. One feature is a shear ring built into the tool so, if the anchor sticks tightly, the ring can be sheared. This causes the tool to strike a heavy upward jarring blow.

After the ring is sheared, the tool can be used as a bumper snub to strike repeated blows until both the anchor and packer elements are jarred free. The tool is set the same way as most tension type of anchors. After the anchor is set, continued raising of the tubing expands the packer against the casing wall to form a seal.

The tool is normally released by reversing the setting procedure. Source: **Shaffer Tool Works, 209 S. Pomona Ave., Brea, Calif., U.S.A.**

"CONSTANT CURRENT" RECTIFIERS STOP WELL CASING CORROSION

New "constant current" rectifiers were used to stop casing corrosion on 29 wells in West Texas recently. The wells are owned by a major oil company and are in Borden County.

Several casing leaks had already occurred in the field. The operator felt that protection was necessary.

CSI engineers installed rectifiers to provide the electrical current which is projected onto the casing to stop external corrosion. CSI furnished the rectifiers and all the other necessary materials, labor and installation equipment—augers, ditchers, etc. Cost was only about $300 to $350 per well.

The rectifiers used are of a recently developed kind that, for all practical purposes, deliver constant current despite heavy rains or extended dry periods. They compensate automatically for changes in circuit resistance caused by variations in the moisture content of the soil.

CSI expert and experienced engineers are your key to the best in cathodic protection for wells, transmission and distribution pipe lines, tanks, etc. Call or write today for engineering and installation services, and for quality supplies for both magnesium anode and rectifier installations. Prices are competitive.

CSI

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CORROSION SERVICES INCORPORATED
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COMPARE THE ECON-O-MISER WITH ANY ON-OFF VALVE!

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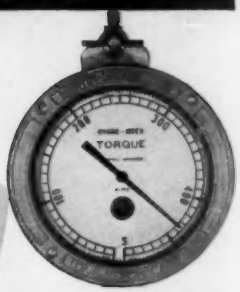

A good Weight Indicator is not enough. For complete knowledge of down hole conditions install the Martin-Decker Hydro-Mech Torque Assembly. This unit fits under the rotary or secondary chain and provides sensitive indications of:

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Fishing Operations
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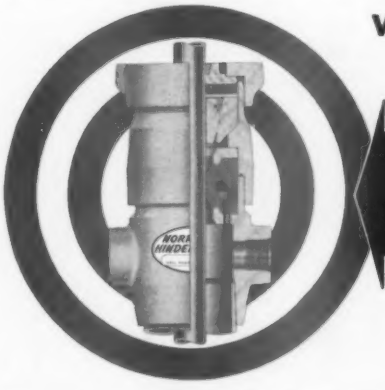

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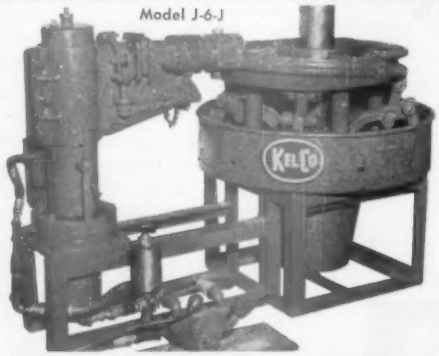
P. O. BOX 1739, TULSA

TUBING & CASING HEADS

Model J-6-J



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Keep Slim-Hole and Workover Rigs Busy!

■ Designed for small rotaries and deep well-servicing units. Lifting ring travels only 3½ inches. Slip bowl bore is 6½ inches. Will also accommodate 4½-in. and 5-in. casing.

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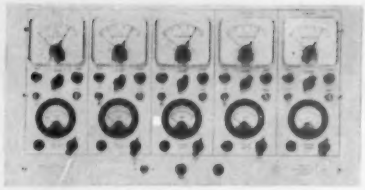

Multipoint gas detector

. . . and alarm provides a central control for multipoint monitoring of the presence and concentration of hazardous, combustible gases at various locations. Sensing elements at desired points detect such gases. Cables connect the sensing elements to the central unit. They may be 1,500 ft. away. Each detection point has its own measuring circuit, indicator, and adjustable alarm. Up to five channels may be handled.

Units are either rack-mounted or case-enclosed. Indications are read directly in per cent of the lower explosion limit of the gas. If gas concentration exceeds a safe value, both alarm and shutdown occur. Source: **Houston Instrument Corp., P. O. Box 22234, Houston 27, Tex., U.S.A.**

The only thing better than a JENSEN JACK is a flowing well!

Get the facts on Jensens before you equip that next well—no matter how deep it is or where it is. Rotary Balance (above) or Beam Balance types.

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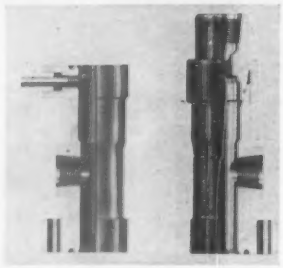
JENSEN JACKS

SHOWCASE . . .

New Equipment

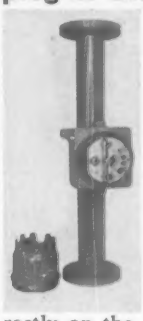


Multiple-completion tubing heads

. . . in a new line are on the market. Suited for either multiple or tubingless completion, the Type M heads are for 1½-in. and smaller tubing. They come with either flanged or threaded connections on the top and bottom. Also, crescent, triplex, and quadruple flanges are available.

Three Type M tubing hangers are available for the new tubing heads. They include a threaded hanger, threaded hanger with back-pressure-valve grooves, and a stripper hanger. Source: **Oil Center Tool Co., Box 3091, Houston, Tex., U.S.A.**

Monitor with plug-in chassis



. . . is available for use in LACT systems and others where it is desired to determine b.s. and w. content of crude oil. The chassis of the Model 2000 monitor is mounted in an explosionproof housing. This housing is mounted directly on the capacitance probe assembly.

According to the maker, this design simplifies installation by eliminating the need for separate mounting and interconnecting cables. Too, the plug-in chassis permits quick installation and removal. A transparent cover for the housing is also available that permits visual indication of the merchantable and excess b.s. and w. lamps. Monitor accuracy is reported to be 0.1%. The b.s. and w. range is adjustable. Source: **Instruments, Inc., P. O. Box 556, Tulsa, Okla., U.S.A.**

SHOWCASE . . .

New Literature

Fundamentals of frequency response

. . . are contained in a newly published 12-page paper. The intent of Bulletin TM-6 is to provide you with a rudimentary knowledge of the terminology and a basic understanding of this relatively new technique in the control field. Source: **Fisher Governor Co., Box 307, Marshalltown, Iowa, U.S.A.**

Mud supplies and services

. . . Catalog 32 presents information on about 70 products ranging alphabetically from "Afrox" to "Zeogel." The 32-page publication, free upon request, breaks the products down into the following divisions: weight materials, inorganic and organic colloids, lost circulation, oil base and oil-base emulsion, chemicals, extreme-pressure lubricants, and miscellaneous mud materials. Source: **Baroid Div., National Lead Co., Box 1675, Houston, Tex., U.S.A.**

Conductivity meter

. . . known as the Model RA-2A, battery-operated and designed for making conductivity measurements in streams, is detailed in a new two-page bulletin. Entirely self-contained and independent of external power sources, the meter doesn't have temperature compensation, but reads conductivity and resistivity at the water temperature, according to the literature. Included are data on calibration, conductivity cells, housing, circuit, batteries, accuracy, and price. Source: **Industrial Instruments, Inc., 89 Commerce Rd., Cedar Grove, Essex County, N. J., U.S.A.**

Data on tubing joints

. . . Catalog DS-61 is now available, free for the asking. An integral-joint comparison table covers the connections of four companies for nominal sizes from ¾ to 4½ in., including weight per foot, wall, inside-diameter drift, upset outside diameter, nominal inside diameter, bored inside diameter, makeup torque, and efficiency. In addition the folder gives API tubing data, API casing data, calculation of running clearance in casing, multiple-tubing installations using one size, stress table, mud table, tubing formula, and thread forms. Source: **Hardy - Griffin Engineering Corp., 3600 Yoakum Blvd., Houston 6, Tex., U.S.A.**

Lubricating-devices

. . . shaft-seals Catalog 65 contains 28 pages of photos, line drawings, specifications and applications. Described and illustrated are oil-hole covers, gravity and wick-feed oil cups, constant level oilers, vibration rod oilers, transparent oilers, oil gages, grease cups, accessories, multiple oilers, air-line lubricators, and shaft seals. Source: **Gits Bros. Mfg. Co., 1850 S. Kilbourn Ave., Chicago 23, Ill., U.S.A.**

Pipe, flange, fitting

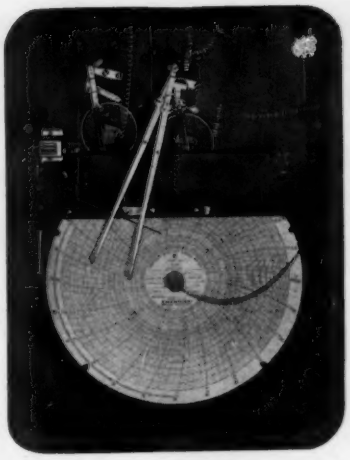
. . . slide card now being distributed, gives pipe, flange, and fitting information in a handy, permanent slide-rule-type card. On one side are tables on pipe sizes, schedule number, wall thickness, weight per foot, and pressure at yield on pipe from ⅛ to 24 in. On the reverse side of the 10-in. card are data on welded flanges and fittings (2 to 30 in.), dimensions, and weight per piece. Also presented are data on cast-iron and steel-flanged fittings, sizes 2½ to 18 in. Source: **Albert Pipe Supply Co., Inc., 101 Varick Ave., Brooklyn 37, N. Y., U.S.A.**

Business-operating-ratios

. . . study includes 14 ratios in 72 lines of business, a comprehensive annual study of operating ratios averaged from a wide sampling of retailers, wholesalers, and manufacturers. The ratios can be used as a yardstick in measuring the performance of your business or company with others. The ratios are complemented with text which details their usage and meaning, how they are compiled, and how they may be interpreted. Source: **Dun & Bradstreet, Inc., 99 Church St., New York 8, N. Y., U.S.A.**

Industrial wire cloth

. . . and screen Bulletin 160 outlines specific data needed when ordering woven wire cloth and screen. Included are: (1) specification tables and illustrations of square-mesh wire cloth from 1-in. center-to-center through 250 mesh; (2) specifica-



AMERICAN® INTEGRATING ORIFICE METERS

American Integrating Orifice Meters provide more accurate measurement by the continuous multiplication of the square root of the measured differential by the square root of the absolute line pressure.

Single, double and duplex-integrating models available in a wide range of manometer types and working pressures. Dust-proof, die-cast aluminum cases... Gasclok and electric instrument chart drives. Also supplied with American Telecounter for remote readings.

Ask for Bulletin 401 for complete details.

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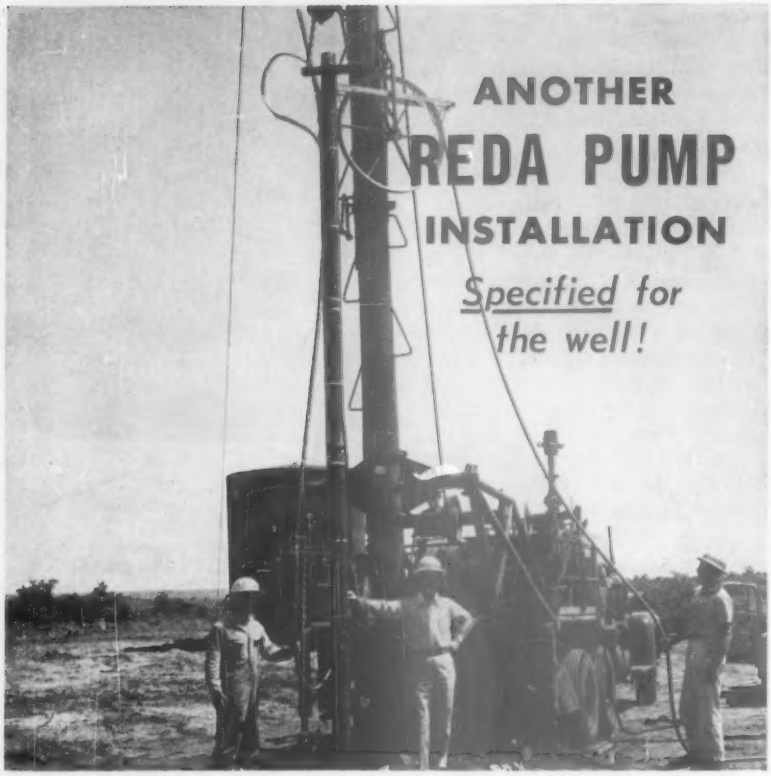
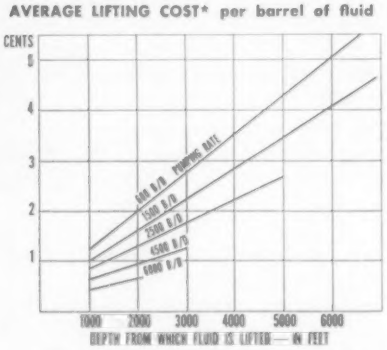


REDA Does the Job Better and at LOWER COST

Billions of barrels of fluid (oil and water) have been produced at an average lifting cost of less than one cent per barrel for each 1,000 foot lift. Chart "A" illustrates average lifting cost from 600 B/D to 6,000 B/D using Reda Submergible Pumps.

Most complete submergible pump line for producing oil wells, water supply wells, brine wells, etc. Sizes range from 5 to over 240 h.p. . . . models for wells cased with 4", 5½", 6⅝", 7" or 9⅝" casing . . . for depths from 500 to 10,000 feet, and for capacities of 100 bbl. to over 18,000 bbl. per day.

AVERAGE LIFTING COST* per barrel of fluid



*Included: Electric Energy (10 Mills Per KWH), Run and Pull, Repairs, Upkeep, Transportation, Labor and Amortization (8 Yrs.)

Chart "A"

Write for Descriptive Folder R-686 Today

REDA PUMP COMPANY / BARTLESVILLE, OKLAHOMA

Manufacturers of Submergible Electric Motors & Pumps for over 40 years
Pumps for Oil, Brine, Water, Gasoline, Jet Fuel, Chemicals, LPG

SIGN OF QUALITY SUBMERGIBLE REDA PUMPS

tions and illustrations for square-opening-space cloth from 4 through ⅛-in. openings; (3) reference data such as screen characteristics, weight-conversion tables, U. S. Standard Sieve series, square-to-round equivalents, and decimal equivalents; and (4) equations for calculating weights of wire cloth and clear or space openings. Source: **Cleveland Wire Cloth & Mfg. Co., 3573 E. 78th St., Cleveland 5, Ohio, U.S.A.**

Oil-base emulsion mud

. . . trademarked "Invermul," is outlined in a new four-page publication just announced. A tan-colored powder, the product is said to stabilize emulsion, aid its suspension properties, and help in reducing filtration. The literature lists applications, preparation, features, limitations, and advantages. Source: **Baroid Div., National Lead Co., Box 1675, Houston, Tex., U.S.A.**

Two-way radio guide

. . . titled "Under the Influence of Radio" gives some of the more important FCC licensing requirements. The 16-page nontechnical guide discusses operational methods, such as how a message is sent, how to adjust a mobile radio, and record keeping. Source: **Communication Products Dept., General Electric Co., Box 4197, Lynchburg, Va., U.S.A.**

Electronic-information

. . . searching brochure describes a new electronic system of searching metallurgical and related literature for specific information on subjects. It discusses the mechanized way to reduce costs and increase accuracy, speed, and effectiveness. The eight-page brochure shows how subscribers may receive, every 2 weeks, information on anything published in the preceding 2 weeks in their field of interest. Source: **American Society for Metals, Metals Park, Novelty, Ohio, U.S.A.**

New plug valves

. . . of three, four, and five-way design, are featured in a new single-page literature sheet. It gives a photo, line drawings, features, and dimensions. Source: **Conant Bros. Co., Inc., 427 Riverside Ave., Medford 55, Mass., U.S.A.**

▶▶▶ Equipment Men Notes

Tube Process Corp. elects

. . . J. (Tiger) Hood to president and promotes Gale Carroll to executive vice president of the Houston internal-pipe-lining corporation. Hood was formerly in charge of

J. Hood

G. Carroll

new projects and was assistant to the general manager at Baroid Division of National Lead Co. He has 24 years experience in drilling and production.

Carroll was formerly sales manager for Tube-Kote and has been connected with the engineering and sales of internally coated oil field and industrial pipe since 1945. He developed the centrifugally cast lining process used by Tube Process Corp. in its Houston plant.

Minneapolis-Honeywell appoints

. . . J. E. MacConville as a sales coordinator for its Special Systems Division and names Fred B. Akerson to succeed him as regional industrial sales manager in Atlanta. Ellery Hall, director of the company's Education Center in Philadelphia, will assume Akerson's former duties.

Oil Center Tool Co. transfers

. . . Kenneth W. Sewell, sales representative at Odessa, to Dallas; and James J. Humphries, sales representative at Dallas, to Houston.

GRANT SUPPLY CO. has been formed in Tulsa to supply pipe, tubes, valves, and fittings throughout the Tulsa area. Also established, as a joint venture, was a warehouse for commercial space. Principals of the new company are Charles B. Grant, president, and Charles R. Groves, secretary-treasurer. The 60,000 sq. ft. warehouse, recently purchased from Flint Steel Corp., is equipped with inside rail and truck facilities.

Jack Mershon is appointed

. . . area sales manager for C-B/Southern's Mid-Continent district in Tulsa. His area includes the mountain states, west-central states, and western Canada. Mershon was previously president of Southwest Industries of Texas and vice president of Southwest Industries, Inc.

Tube-Kote, Inc. promotes three

. . . to sales-manager posts in its Tubular Sales Division. Appointed were: A. A. Prats, Jr., Gulf Coast Division, including the Houston, Lafayette, and New Orleans areas; Grady Howell, northern division which includes North Louisiana, North Texas, Oklahoma, and Arkansas; and Joe Williams, Canadian division, where he is responsible for all Tube-Kote sales in Canada.

Parkersburg Rig & Reel names

. . . Luther Roy (Red) Latimer as district manager at New Orleans, according to Howard Kaylor, sales manager. Latimer has been engaged in the oil industry the past 24 years, the last 12 of which he spent with Parkersburg. He was formerly located in the eastern division, headquartering at Parkersburg, W. Va.

Lincoln Electric Co. appoints

. . . A. F. Boucher to general sales manager, advancing from his former post of assistant general sales manager. In this position he relieves J. S. Roscoe who will devote full time to special market-development assignments. Boucher joined the Cleveland firm in 1936 as a field engineer. Since 1939 he was a district manager in Lincoln's Milwaukee and Detroit territories.

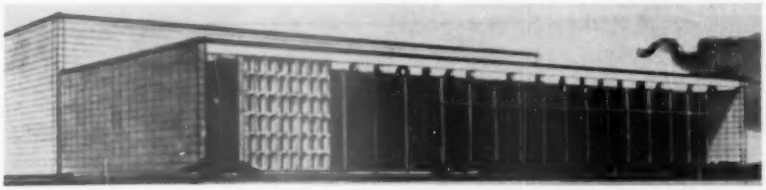
J&L Supply Division transfers

. . . W. W. Springer from Snyder to Odessa, Tex., where he will continue as salesman, reports W. L. Wolfe, vice president of sales. Springer joined Jones & Laughlin in 1948 as a storeman at Odessa.

Erwing and Chapman join staff

. . . of Tyson Smith Co., manufacturer of oil-field-process equipment. John Erwing will serve as a process engineer making his headquarters in Houston, while William W. Chapman will work primarily in sales and service, locating in Pampa, Tex.

Previously Erwing was with Butler Mfg. Co. and Delta Tank Mfg.



HOUSTON SUPPLY STORE of George E. Failing Co., Enid, Okla., will be moved into new quarters in the 3400 block on the Gulf Freeway May 1, according to Robert M. Greer, Failing president. Failing, manufacturer of portable drilling rigs, is a subsidiary of Westinghouse Air Brake Co. The new building, now under construction, will contain 9,000 sq. ft. of floor space. In addition to Failing offices, it will provide space for the Houston operations of Westinghouse Air Brake; and Industrial Products Co. and Union Switch & Signal Co., other Westinghouse divisions.

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DIVISION OF THE DOW CHEMICAL COMPANY

Co. Chapman takes a 5-year background in design and sales of petroleum equipment to his new position, including associations with Petco and Manning, Maxwell & Moore.

D. E. Whittenberg becomes v.p.

. . . and marketing manager for Udell, Inc., with headquarters at the company's general sales offices in Houston. He will be in charge of sales and marketing for Udell gas-lift equipment, packers, chemical pumps, flowmeter equipment, and positive reservoir-control apparatus. One of the original founders of Garrett Oil Tools some 14 years ago, Whittenberg resigned as vice president and general sales manager of the company which is now a division of U. S. Industries, Inc.

William Miskimins is manager

Wm. Miskimins

. . . of store products for Oil Well Supply Division of U. S. Steel Corp., according to W. A. Weir, the division's vice president in charge of sales. Miskimins will locate at Oil Well's Dallas headquarters. He has served as manager of the Central-Midwest area since 1954.

Other division appointments include: S. B. O'Bannon, field representative at Kermit, Tex.; James C. Dendy, assistant district engineer for production equipment at Shreveport; Edward W. Metters and Curtis T. Deehr, city representatives in Los Angeles; and William A. Slocombe, manager of tubular sales at Calgary, Alta.

Dennis M. Frauenberger joins

. . . Southwest Industries, Inc., of Houston, to serve as a sales engineer, according to E. C. Broun, Jr., vice president and director of sales. Prior to joining the company, Frauenberger was with Tuboscope Co., working in field inspection, quality control, and general sales.

Cooper-Bessemer promotes

. . . R. J. Graham to sales engineer in the Mount Vernon, Ohio branch sales office of the east-central sales district. He will report directly to J. R. Craine, assistant manager of the district and Mount Vernon branch manager. The district, under F. M. Devin, vice president and district sales manager, is composed of branch offices in Detroit, Pittsburgh, Grove City, Pa., and Mount Vernon. Graham went to Cooper-Bessemer in 1958 as a sales-engineer trainee.

Anthony J. Ormsby becomes

A. J. Ormsby

. . . secretary-treasurer of W. C. Norris Division, Dover Corp., of Tulsa. The announcement was made by William L. Butler, Norris president. Ormsby received his formal education in Canada and has been a chartered accountant, the counterpart of a certified public accountant, since 1952.

R. S. Wick is service manager

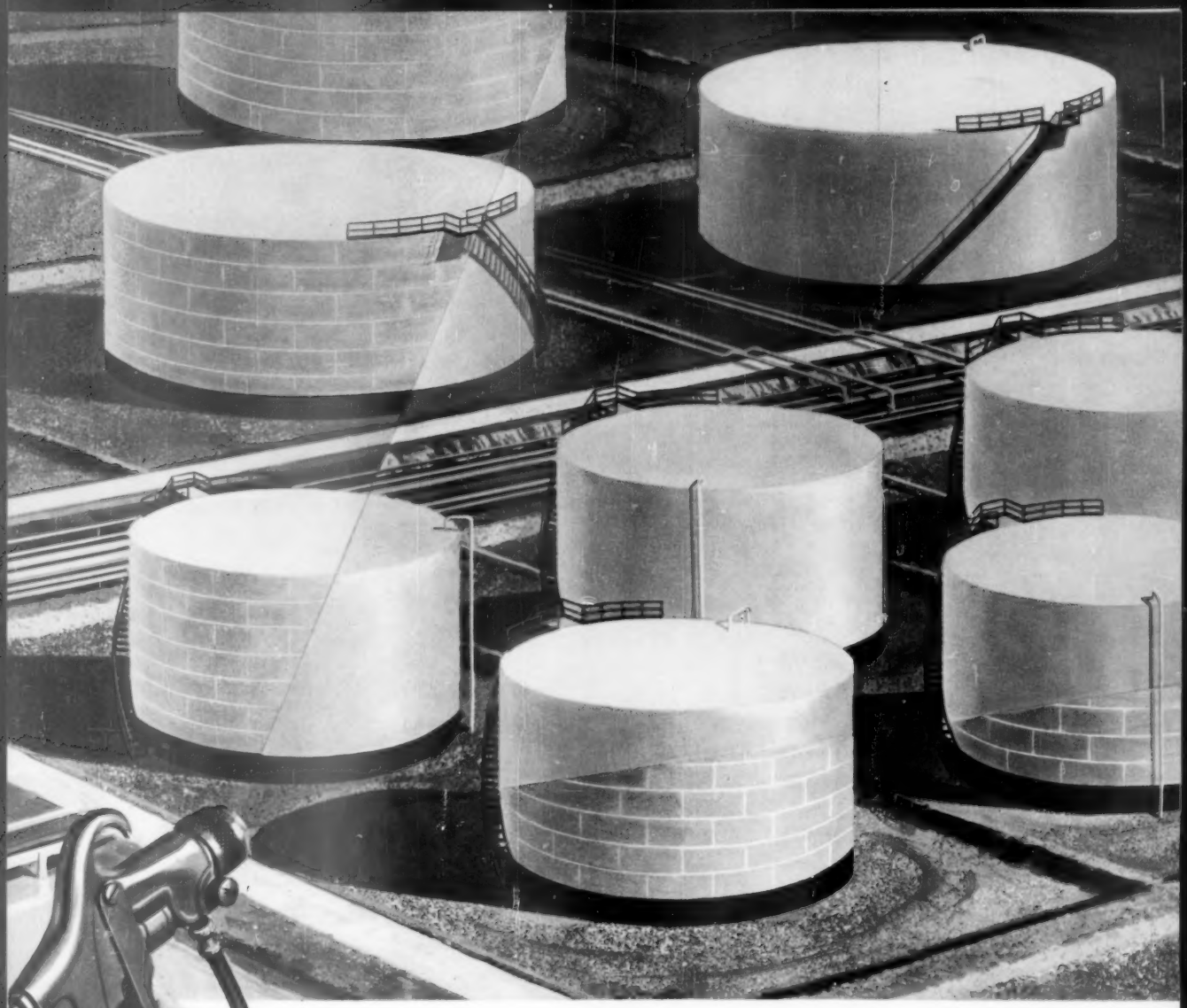
. . . of two-way-radio equipment and other communication lines of General Electric Communication Products Department, Lynchburg, Va. William Torbick, former district manager at Syracuse, N. Y., takes over as GE's regional manager for mobile communications at Columbus, Ohio.

The company also announced the following district sales manager appointments for two-way-radio equipment: Ray C. Linnertz, Syracuse; Donald E. Gillick, New Rochelle, N. Y.; and Eugene Morrison, Wellesley, Mass.

J. W. Anderson named manager

. . . of the power-transmission sales department of Hewitt-Robins, Inc., with responsibility for sales of all power-transmission products, including chains, speed reducers, couplings, pulleys, and related equipment.

Anderson has had more than 25 years experience in the power-transmission field. Since 1955 he has been in charge of sales of the company's Union Chain Division at



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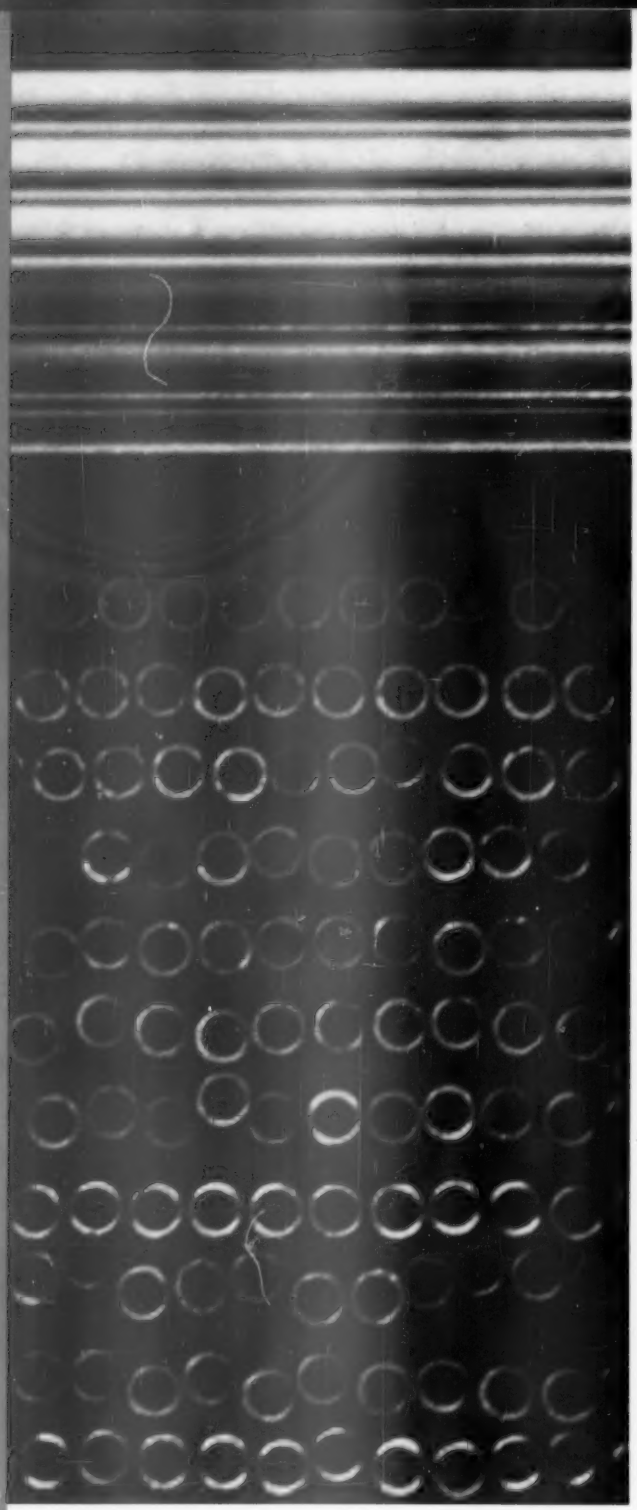

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24-hour service on Youngstown Orange Band pipe from in-transit stocks

CASING. Get all weights in four grades of seamless casing from 4½" through 13⅜" O. D. API (long or short) T&C in H-40, J-55, N-80 and P-110. Youngstown's Buttress T&C, Extreme Line and Speedtite integral joints in J-55, N-80 and P-110.

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Sandusky, Ohio. In his new post he will locate at the company's executive offices in Stamford, Conn.

J. S. Downs elected vice prexy

J. S. Downs

. . . of ACF Industries, Inc., according to William T. Taylor, chairman of the board. Downs will continue to be in charge of W-K-M Division as vice president of ACF Industries and general manager of W-K-M.

Taylor noted that the appointive titles of division president and division vice president have been eliminated in all of the company's operating divisions. He added that each former division vice president now holds the title of director of his respective activities, without change in authority or responsibility.

Edwin L. Kinkaide joins

E. L. Kinkaide

. . . the valve and fitting sales division of Henry Vogt Machine Co.'s New York office. Kinkaide was formerly with Ohio Injector Co.

S. L. Barber elected vice prexy

S. L. Barber

. . . of Walworth Co. and president of its pipe-fabricating subsidiary, Southwest Fabricating & Welding Co., Inc., of Houston. He succeeds A. B. Judd as president of the subsidiary. Judd will become chairman of the board of Southwest. Barber was formerly executive vice president of Taylor Forge & Pipe Works and is president of Uni-Flex Mfg. & Engineering, Inc., of Los Angeles.

Walworth also announced the appointment of Michael C. Malloy to western divisional sales manager, Lubricated Plug Valve Division. Malloy has had 3 years with Walworth and its subsidiary, Grove Valve & Regulator Co. as a sales engineer.

Two new directors are named

. . . by the First National Bank & Trust Co. of Tulsa, announces R. Elmo Thompson, chairman of the board. Elected to the board were Walter H. Helmerich III, president

W. H. Helmerich

Guy R. Mabee

of Helmerich & Payne, Inc., and Guy R. Mabee, independent oilman and rancher.

Helmerich became president of Helmerich & Payne last December. He has been with the company 10 years and has been active in oil and gas production, contract drilling, pipeline construction, and natural-gas odorizing. Mabee's home is in Belton, Tex., where one of his ranches is located, but his oil interests cause him to divide his time between Tulsa and Belton.

Tretolite Co. of California hosts

. . . several hundred customers, suppliers, neighbors, and friends in marking the completion of its new plant in Brea, Calif. The new facility includes a 7,500-sq. ft. administration building, three laboratory buildings, and a manufacturing section having 48,000 sq. ft. under roof. Total investment exceeds $2 million. The plant's production capability exceeds 10,000 drums of products monthly.

R. A. (Bob) Kent is transferred

. . . to Baker Oil Tools, Inc.'s West Texas district headquarters in Odessa. His responsibilities under district manager J. T. Mitchell will include supplying Baker customers with technical advice on new products, performance data on existing products, and information on technical hookups. Kent joined Baker in 1955 as a design engineer and advanced to the position of senior staff engineer.

4 contracting engineers assigned

. . . by Chicago Bridge & Iron Co., world - wide steel - plate fabricating and construction firm. Arthur G. Albertson and William T. Livings have been transferred to the New Orleans sales district, Harry E. Douglass, Jr., to Cleveland, and Stanley V. Whitehead to Kansas City, Mo. CB&I also announced the transfer of its process division headquarters and pilot plant from New York to Chicago.

Joe Martin elevated to manager

Joe Martin

. . . of production-machinery sales of Continental-Emsco Co. Former division production - equipment specialist, he has been with the company since 1955 and will now headquarter at G-E's general offices in Dallas.

Assuming Martin's previous job is Morris Caraway, who will be stationed in Tulsa. Caraway was formerly district production - machinery sales engineer in Wichita Falls, Tex.

Promotions to D+B specialists include Harlan Cook, Oklahoma City; Eldon Davis, Winnsboro, James Sorrels, Ellinwood; James Allen, Snyder, Tex.; and James Lowery, Jena, La. Latham Ryan has been transferred from Hobbs, N. M. to Lubbock, Tex., as district production-machinery specialist.

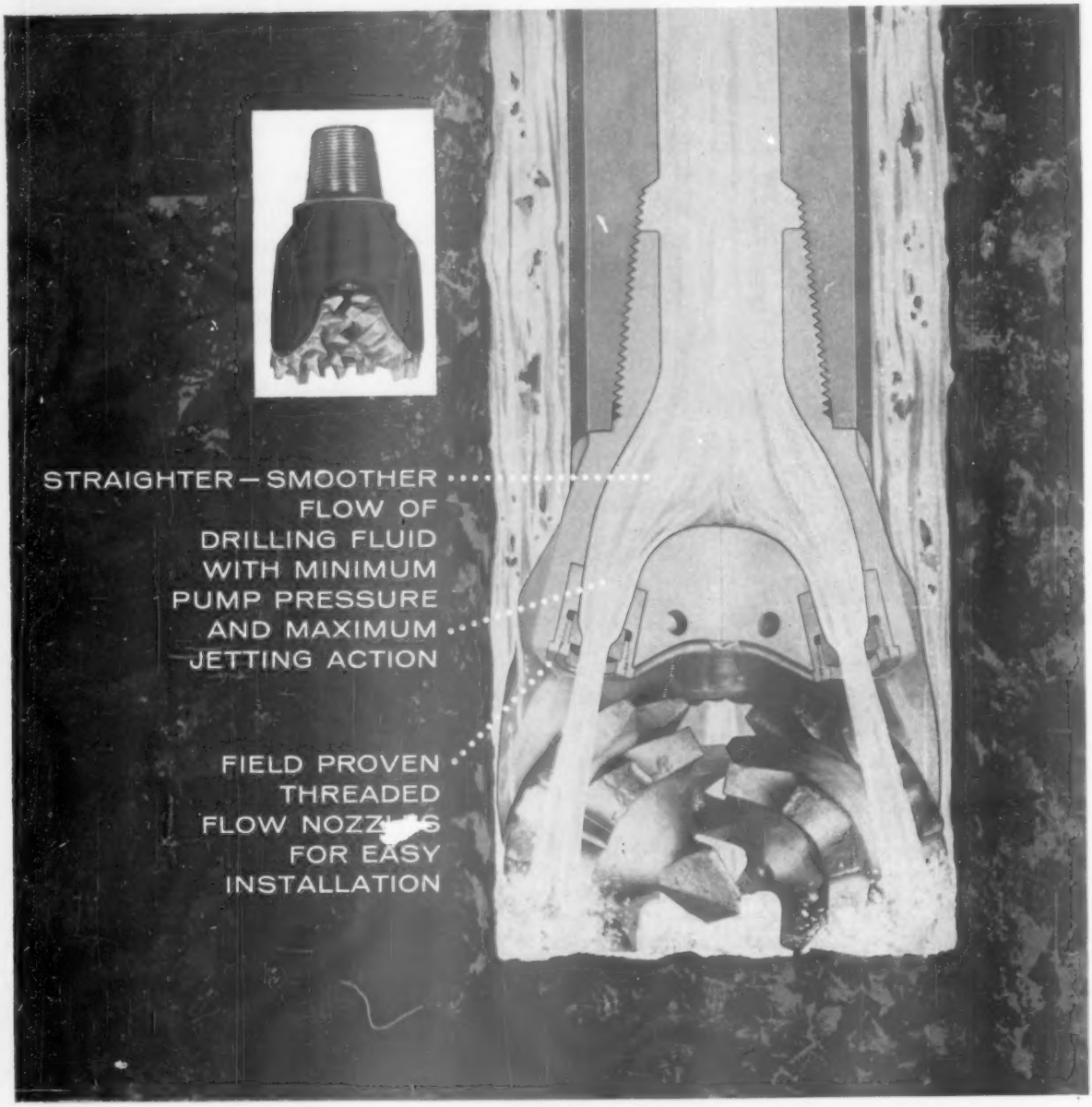
Thomas I. Stacy named manager

T. I. Stacy

. . . of Rockwell Mfg. Co.'s newly created valve-actuator - products department with headquarters in Pittsburgh, announces Paul C. Kreuch, vice president — sales, of the Meter & Valve Division. Previously assistant product manager of pipeline and gas utilities valve sales, Stacy will now supervise sales and administrative activities of his new department.

He will also coordinate the work of central engineering and other plant engineering departments on this type of equipment. Stacy joined Rockwell in 1938, became a sales engineer in 1940, Houston district sales manager in 1954, and was promoted to his most recent post in 1957.

Smith 3-CUTTER JET ROCK BITS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DATA ON
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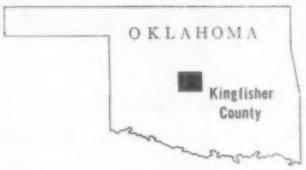


Kingfisher County, Oklahoma

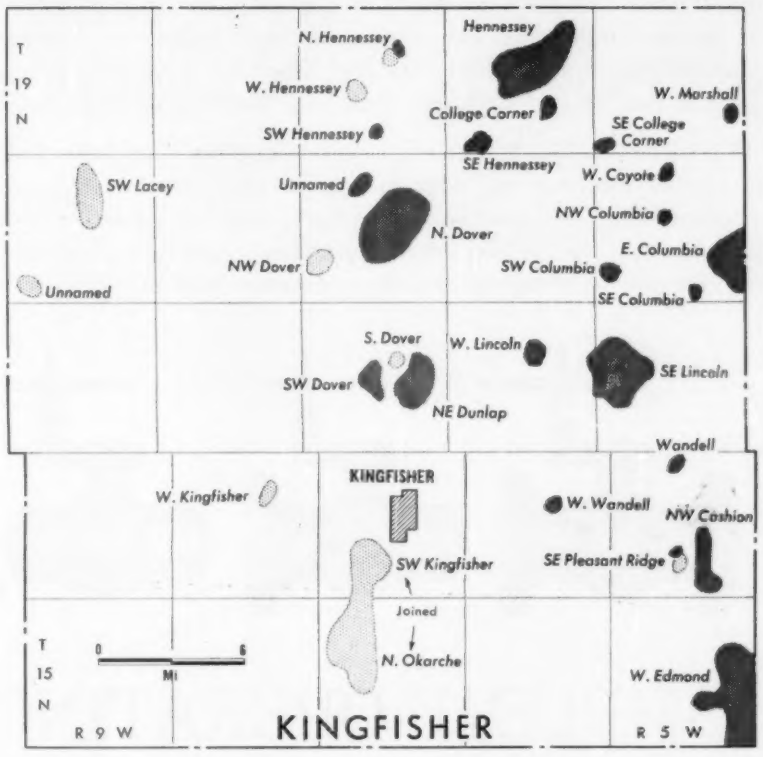
1. APPROVED field names: There are now at least 26 fields in the county of which four are unnamed (see map). Location: West. Central Oklahoma on the eastern flank of the Anadarko basin in a down-faulted area west of Nemaha Ridge. Regional dip is generally southwest.

2. Discovery wells: Gas-condensate was found in the county in 1939 and oil in 1945. Anderson-Prichard Oil Corp. 1 Geis, C NE SW 15-18n-9w, flowed 3 M.M.c.f. and 11 bbl. condensate at 7,330-52 ft. from the Pennsylvanian-Inola, was initial pay in the Southwest Lacey field. In 1945, an extension of the West Edmond field (discovered in 1943) produced the county's first oil from Bois d'Arc-Hunton section. First new pool opener within the county was Phillips Petroleum Co. 1 Jirick in C SW SW 25-16n-5w, with Hunton production opening Northwest Cashion field in 1945.

3. Trend of development: Exploratory drilling has had no set pattern. Development wells spread into the southeast corner (15n-5w) in extending the West Edmond field. Production has spread generally from east to west.

4. Number of Producing wells: Total tally of well is an ever-changing picture because of high drilling activity. There are now over 200 producing wells. (During 1960, 101 wells were completed along with 20 gas-condensate wells.)

5. Spacing pattern: Variable—from 10 to 640 acres. In the Hennessey-Dover area, wells are being drilled on 80 acres.



6. Proved acreage: In Excess of 36,000 acres, estimated.

7. Principal operators in area: Humble, King-Stevenson, Jones & Pellow, Sunray Mid-Continent, Apache, Calvert, Ohio, Texaco, Pure, Phillips.

8. Present allowable: Oklahoma made new allowable regulations effective earlier this month. Based on a depth-acreage chart, allowable can be readily computed. (See The Journal issue of January 23, 1961, p. 48 for a copy of the chart.)

Drilling Operations

9. Number of active drilling rigs: 57 drilling and 13 locations staked.

10. Casing program: 10¾-in. surface set at 650 ft. with 550 sacks of cement. 5½-in. production string set at 8,200 ft. with 300 sacks of cement. In some areas, 4½-in. oil string is used.

11. Average drilling time per well: 34 to 36 days to 8,200 ft.

12. Types of drilling fluid: Barite, gel, lignosulfonate, lignite, soda ash, caustic soda, and some lost circulation material.

13. Completion methods: perforate casing, fracturing, and acidizing.

14. Number of bits: 30 to 33.

15. Special drilling problems: Lost circulation in some areas.

Geology

16. Producing formations: There are at least 11 known producing horizons, which include: Pennsylvanian (Layton, Cleveland, Oswego, Red Fork, Inola, and Bartlesville); Mississippian (Parvin, Manning, and Mermec); Silurian and Devonian (Hunton); and Ordovician (Wilcox).

17. Reservoir characteristics: Most of the reservoirs are solution gas with some water drive in the Wilcox. Gas-oil ratio: low 375/1; high, 1,250/1; average, 550/1.

18. Geologic markers: Due to the multiplicity of pays, these formations serve as excellent markers.

19. Type trap: Chester and younger are generally stratigraphic. Below the Chester mostly structural.

20. Core data: (Manning) Porosity, 11.3%. Permeability, 36 md. Residual oil saturation, 21.2%. Total water saturation, 31.4%. Average feet of pay, 21.

21. Estimated recoveries and average net thicknesses: Oswego, 75 bbl. per acre-ft., 11 ft.; Manning, 100 bbl. per acre-ft., 21 ft.; Meramec, 30-50 bbl. per acre-ft., 33 ft.

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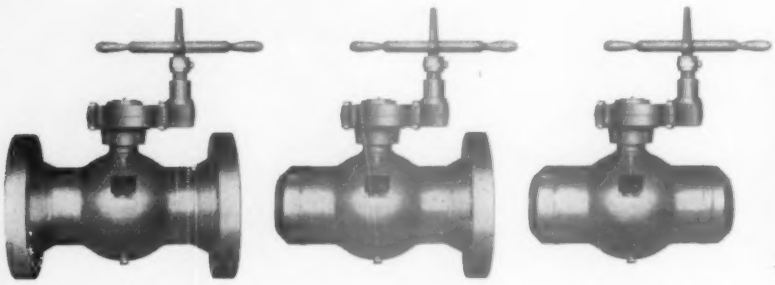

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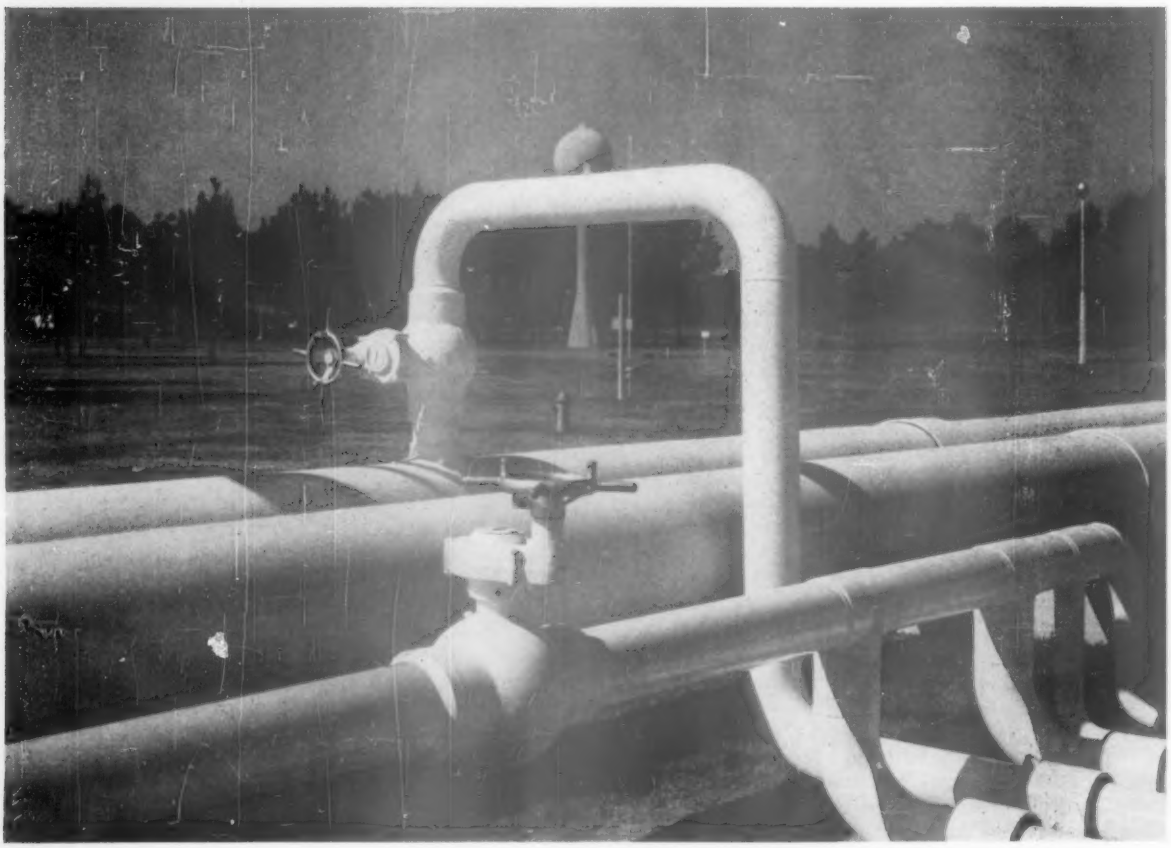
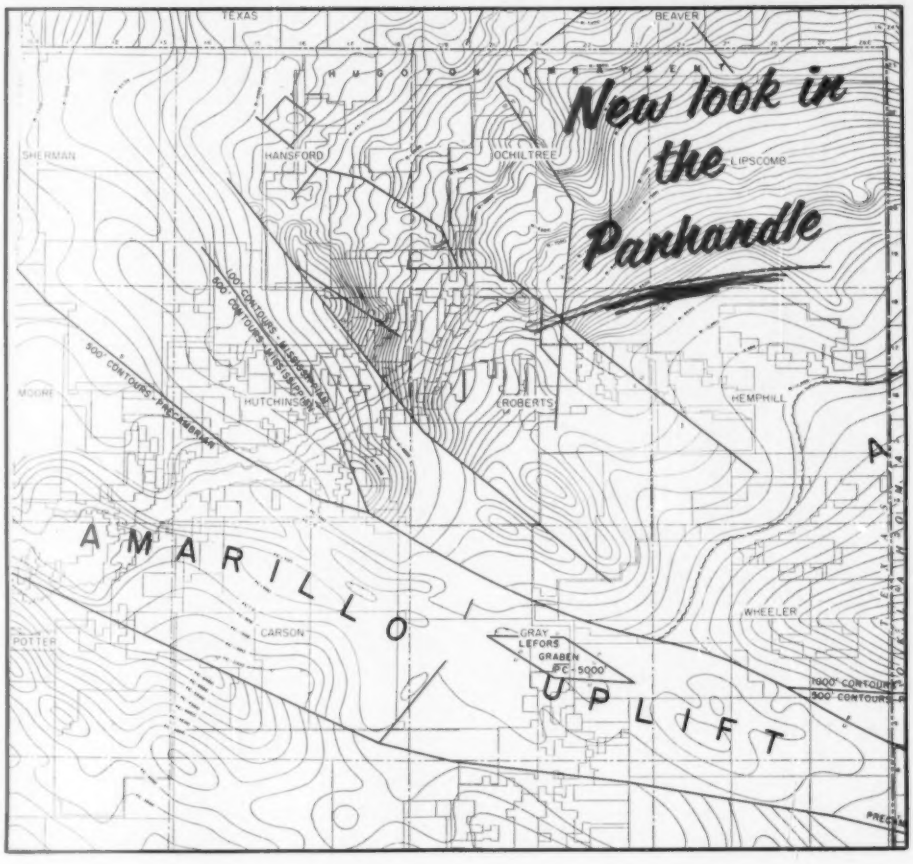




EIGHT YEARS ago, Robert R. Wheeler published his "Structural Map of Oklahoma," which included much of the Texas Panhandle. Today, his newest work "Structural Map of the Midcontinent," displays an entirely different interpretation of the panhandle province. The vast number of new and deeper wells that were drilled in these 8 years has provided the basis for the changed picture of the subsurface there. The "new look" shows a very significant fault pattern in pre-Pennsylvanian rocks . . . a key, perhaps, to important future discoveries in this region.

New map, new ideas could mean new oil

BY FRANK J. GARDNER

ONE OF THE most useful and important geologic research tools to appear in many years has just been released by its creator, Dr. Robert R. Wheeler, consulting geologist of Dallas. His "Structural Map of the Midcontinent," now being displayed throughout the oil patch, is replete with new concepts of subsurface structure, and should stimulate a lot of constructive thought on the part of Mid-Continent geologists.

Wheeler doesn't expect complete agreement with his interpretations. But if his work can inject new ideas into the heads of oil finders and lead to new discovery, the author will have served the industry well.

The new map is being issued in three series of three sheets each, on a scale of 1 in. to 6 miles. The Central Series (covering eastern New Mexico, North Texas, Texas Panhandle, and all but extreme northern Oklahoma) and the Southern Series (West Texas, southeastern New Mexico, and Central and eastern Texas) are now in print, and the Northern Series (covering southeastern Colorado, northern Oklahoma, and Kansas) will become available soon. In all, an area of 440,000 sq. miles is involved. Wheeler estimates that 750,000 wells have been drilled within the coverage of his work.

The base map shows key survey, township, and range lines, state lines, and counties; highways, railroads, towns, and drainage were eliminated to allow an uncluttered base. Contours, on top of the structurally most significant horizon in the immediate area of interest, vary in interval from 100 ft. in gently folded areas to 200-500 ft. in highly complex ones. Overprinted in red are names of regional and structural features of major interest (basins, platforms, uplifts, and intrusives).

As for interpretation, Wheeler favors a positive approach. "Geologists," he says, "differ profoundly in their interpretation of a given set of subsurface data. In this particular project, I have seen widely different renditions of the same areas and data. Without belaboring such extremes as geometric spacing, the wishfully-thought-in closures and near-vertical monoclines that avoid showing faults, it is evident that much subsurface interpretation is ultraconservative."

What Wheeler has done, in essence, is to present his colleagues and the oil industry with 440,000 sq. miles of regional perspective on 100 sq. ft. of paper. It's up to the user of this new tool to achieve its ultimate purpose—the finding of more oil and gas.

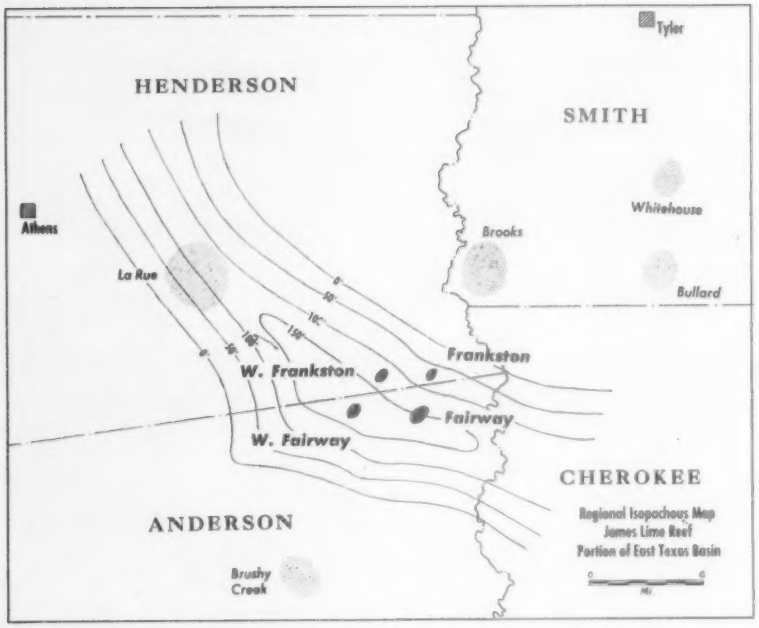
Geologists study Frankston succes

BY FRED L. OLIVER
Fred L. Oliver & Assoc., Dallas

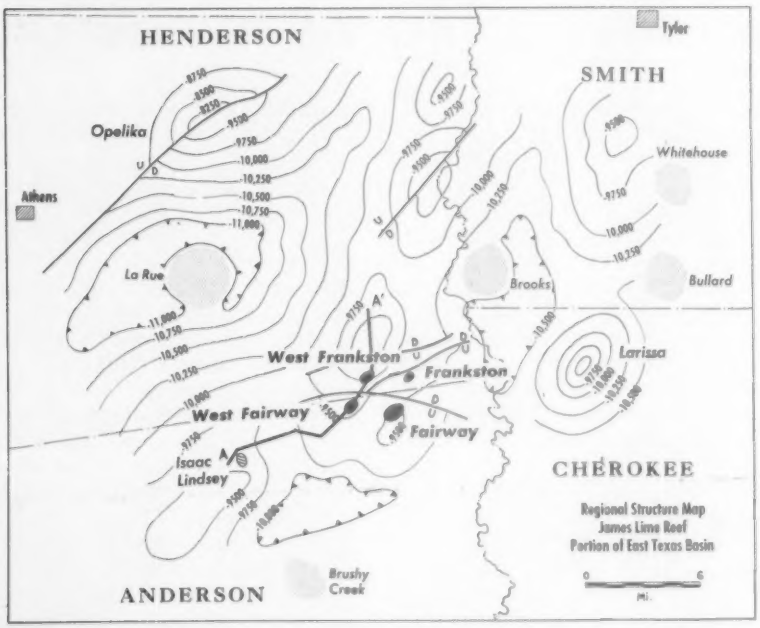
ACTIVITY in the Frankston area of East Texas has caused a complete reevaluation of the James-lime potential in the East Texas basin. All exploration geologists in the area are taking a close look at the Frankston James reef trend and many are making studies to determine if there are other similar reef developments in the basin.

Lower Glen Rose lime and shale formations are distributed throughout most of the upper Gulf Coastal Plain. The Pettet, James, and Rodessa formations are very similar. The Pettet and Rodessa formations have been major exploration objectives for many years. The James lime is usually a brownish-gray dense limestone being rarely oolitic or fossiliferous.

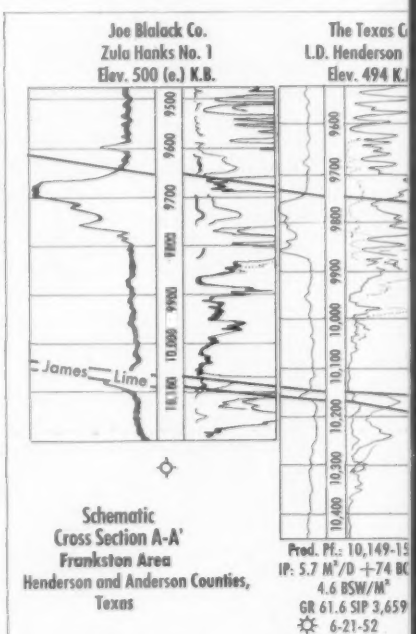
The general lack of porosity or permeability in the James has resulted in a justified lack of interest in the formation by exploration geologists in the past. The production performance of the few James-lime fields in the East Texas



JAMES-LIME REEF areal distribution shows a northwest-southeast trend. The isopach map shows a maximum thickness of slightly more than 150 ft. Located in the Tyler basin of East Texas, the area is in a salt-dome province, five of which are shown. Fig. 1.



STRUCTURE of the James-lime reef shows relationship, if any, to the existing salt domes. Note the complex faulting pattern in the Fairway-Frankston area. The line of cross-section from A to A' runs from Isaac Lindsey field to north of West Frankston field. Fig. 2.



CROSS-SECTION running generally fr

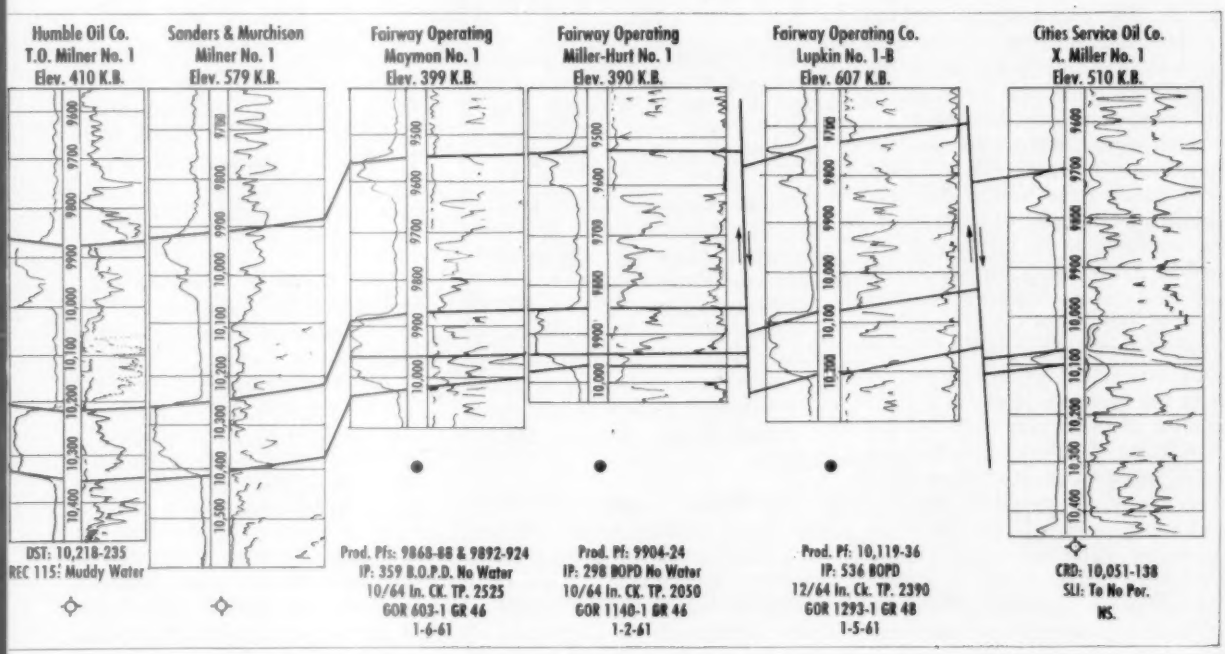
n East Texas

basin has been very poor, and there has been little economic justification in the past to explore for James-lime production.

The Frankston area was first tapped by Cities Service Oil Co. in 1955 when it discovered the Frankston field with the completion of 1 White "E." It then drilled four dry holes in the area and shut down on its exploration for James production. Before that, the Isaac Lindsey field was discovered by the 1 Texaco Hanks and is considered fully developed with two producing wells. In total, before the discovery of Fairway field, there were only three producers in the area and 10 holes had been drilled in the immediate area.

Tom Clay, geologist, engineer, and coowner of Fairway Operating Co., Inc., Tyler, Tex., has had many years experience in the East Texas basin, and in his work in this area, he decided the performance of the Cities Service 1 White "E" justified additional study of the James lime. The performance

DETAILED STRUCTURE of the Fairway-Frankston area shows the producing area outlined to date along with the gas-oil and oil-water contacts. It appears that much more development will be done within these favorable sectors. Note that 14 wells are drilling. Two wells on the line of section are off the map to the west and southwest. Fig. 3.



...e southwest to the northeast shows the thinning and thicken ing of the James lime. Apparent reefing occurs. Fig. 4.

of this well in the 5 years since its discovery has been excellent, counter to the trend of low recovery and low capacity that has been characteristic of the James. It was this performance that caused Tom Clay to take a second look at the area.

There were sufficient electric logs, core information, and other data to permit a rough regional study of the James lime. The study proved the James to have a reef trending northwest-southeast as shown in Fig. 1., and this is roughly perpendicular to the structural grain of the area with most regional structures trending northeast-southwest as shown in Fig. 2. The change in lithology in this area from that generally accepted for the James lime in the East Texas basin caused the greatest interest. The core descriptions and sample analysis indicated this to be a fossiliferous, oolitic, coquinoidal reef development in addition to some dense crystalline and sandy porous zones. Vertical fractures were also indicated in core description, and the porosity and permeability could be classified as good.

The indicated structure of the Frankston area is mapped in more detail in Fig. 3. There is some normal faulting in the area and also variations in oil gravity, gas-oil ratios, and water levels in the various fault blocks. A north-south cross-section, Fig. 4 indicates the buildup of the reef development in the center with complete wedgeout of porosity both north and south of the area now so actively developed.

This study, along with the performance data on the Cities Service well, caused John Prothro, the other coowner of Fairway, to begin blocking up leases on the known regional structural ridge that extends northeastward from Anderson County through Henderson County into the southwestern part of Smith County. This anticlinal ridge is bounded on both the west and east by a large number of salt domes. The Fairway 1 Wofford discovered the Fairway field, and subsequent wells by Fairway discovered the West Fairway and the West Frankston fields. Nine producing wells and two dry holes have been drilled in the area since the Wofford discovery. Fourteen additional locations have been announced, and most of these are now drilling. Three major oil companies have also joined the play in recent weeks.

The average well has been encountering the James lime at a depth of 10,000 ft. with from 100 to 150-ft. thickness of James reef and 60 to 80 ft. being net porus and permeable section. The crude averages 49°-API gravity. The average porosity is 13.6%. The permeability averages less than 50 md., and the connate water ranges from 28 to 50%. The average well potential is 500 bbl. of oil per day on 12/64-in. choke with a gas-oil ratio of 1,300-1. Where possible, these fields are being developed on 160-acre spacing to permit rapid definition of the area. This area is in the initial stage of development, and it is probable that there is more than 100,000,000 bbl. of oil in place. Plans are being made now to assure optimum recovery of this oil.

Fairway has programed some 36 wells in the Frankston area to be drilled during the next 12 months. Other operators will probably bring this total to 50 wells during the year. It is estimated that an additional 20 wildcats will be drilled in East Texas this year with the primary objective being the James lime.

Nebraska drillers are hitting

CONSIDERABLE exploratory activity is meeting with success in several southwestern Nebraska counties in the Cambridge arch country.

Hitchcock County. Burch Drilling Co. ran casing at a Lansing-Kansas City Pennsylvanian oil prospect 5½ miles west of Reiher field and 10 miles southwest of Trenton. The 1 Steinke, C NW NW 28-1n-33w, recovered 10 ft. of free oil, 30 ft. of heavily oil-cut watery mud and 90 ft. of slightly oily water on drill-stem test at 3,940-70 ft. Recovery after being open 2 hours was 765 ft. of gassy oil and 170 ft. of muddy oil on test at 4,037-70 ft.

Red Willow County. Burch is starting a new test in Silver Creek field, Red Willow County. The 1 Haag, C NW NW 19-2n-26w, is slated for 3,600 ft. or granite.

Furnas County. Exeter Drilling Co. and Kaiser-Francis are completing a discovery, the county's first producer, 5 miles south of Cambridge. The 1 Palmer, NE SE 17-2n-25w, 8 miles northeast of Sleepy Hollow field, swabbed 1 bbl. per hour, natural, from perforations at 3,391-94 ft. Following acid wash, it flowed 2 bbl. per hour for 16 hours.

Red Willow County. K&E Drilling Co. is running production tests at a Lansing oil discovery 8 miles southeast of Ackman field at 1 Boyd, C NW NW 23-1n-27w, 4 miles southwest of Lebanon. A drill-stem test at 3,184-3,230 ft. got 120 ft. of muddy oil, 180 ft. of very heavily oil and gas-cut mud, and 60 ft. of clean oil.

Harlan County. Buick Drilling Co. and W. P. Simmons 1 Johnson is a possible Lansing oil discovery in SW SW 14-1n-18w, 4 miles northeast of Fischer field and 5 miles southeast of Alma.

Three pay zones set at Southwest Kansas wildcat

Three gas pays are indicated at a well in northern Morton County in Southwest Kansas. The well is Thomas & Brewer 1 Rosson, C NE NE 19-31s-41w, 1½ miles southwest of Patsy Morrow Pennsylvanian gas field.

Production tests are slated for the Wabaunsee, Morrow "G," and Keyes sands. A drill-stem test at 2,860-2,920 ft. got 1,020 M.c.f. in 1 hour. A test at 5,102-28 ft. in the "G" sand got 565 M.c.f. in 1 hour. A test at 5,172-5,260 ft. in Keyes sand got 481 M.c.f.d.

Lane County. Petexco has a Marmaton Pennsylvanian oil discovery indicated 10 miles southwest of Dighton in western Lane County.

The 1 Emundson, C NW NW 33-18s-30w, got 750 ft. of free oil and 700 ft. of gas in the pipe during drill-stem test at 4,361-78 ft. Location is 6½ miles southwest of abandoned North Fork field.

Harper County. Cities Service Petroleum Co. is below 4,951 ft. at 1 Mattingly, SW NW NE 12-34s-6w, after finding oil in the Lansing at 3,765-80 ft. Recovery was 129 ft. of heavily gas-cut oil, 98 ft. of

heavily gassy, muddy oil, 88 ft. of heavily gasssy, oily mud, and 5 ft. of muddy water. Location is 2 miles south of Stohrville field and 6 miles southeast of Anthony.

Barton County. Southeast Redwing field has been confirmed by Nadel & Gussman at 2 Eveleigh "B," S½ SE SW 5-18s-12w. The well pumped 202 bbl. of oil per day from open hole in the Arbuckle at 3,345-48 ft. The well confirms the discovery of last December at 1 Eveleigh "B" in N½ NE NW 8-18s-12w. That one made 135 bbl. per day from Arbuckle open hole at 3,351-55 ft.

Pratt County. Kenwood Oil Co. completed 1 Moore in SW SW SE 28-29s-13w, Viola discovery for Jem field, flowing 207 bbl. per day through 30/64-in. choke. Viola perforations were at 4,474-88 ft. The well revives the field.

Double find opens new field in Texas' Panola County

TWIN DISCOVERIES, one in the upper Rodessa and the other in the shallower Blossom sand, are opening a new field in the southwestern corner of Panola County, East Texas.

Discovery wells, both drilled by S. A. Cochran and R. E. Bradshaw, of Tyler, are only 35 ft. apart.

The Rodessa well, 1 Joe Densmore, is productive of gas and condensate with pay at 6,270-82 ft. Open-flow potential is 6,800 M.c.f. of gas. Condensate yield is 16 bbl. per 1 M.M.c.f.

The Blossom well, 2 Densmore, flowed 11 bbl. of 48°-gravity oil per hour in tests through 12/64-in. choke. Its pay is perforated at 3,018-27 ft.

Locations, near the Rusk County line, are 7 miles from nearest Rodessa production, in Minden field, in Rusk County, and more than 25 miles from nearest Blossom production, in the Tacoma area, on the northeast edge of the giant Carthage field to the northeast in Panola County. Nearest Rodessa production in Carthage field is 16 miles northeast. Shiloh, closest field, produces from the Pettet and Travis Peak zones.

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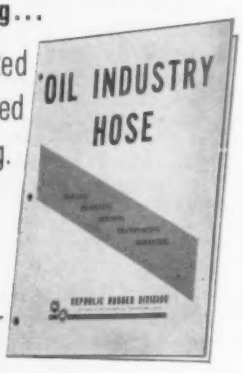

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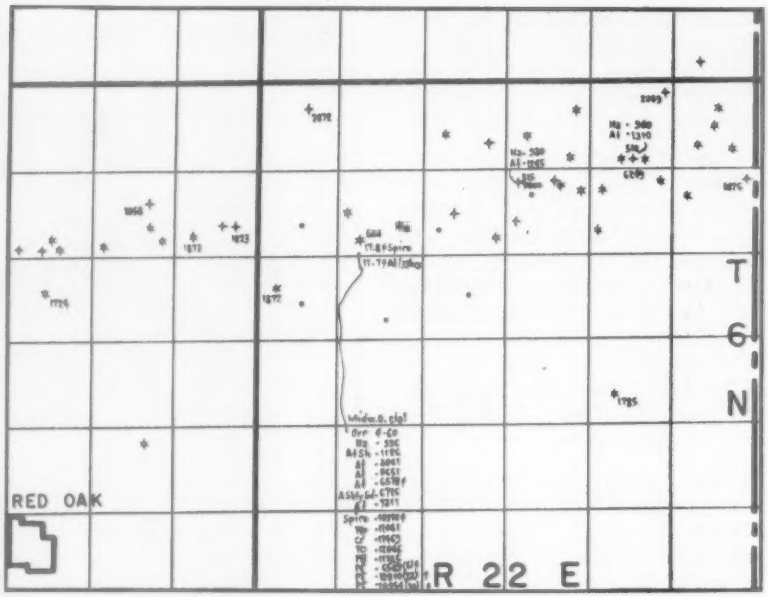

HERE IS a small section of a large-scale map of the Arkoma basin, now available from Herndon Map Co., Oklahoma City. Section shown is the Red Oak area in southeastern Oklahoma.

Arkoma may available

A new, large-scale map of the Arkoma basin is now available from Herndon Map Co., Box 461, Oklahoma City. This map, showing all wells drilled in the two-state basin, is on a highly workable scale. Well history is shown, township, range, section, counties, and important towns. It is the first such map to show both sides of this important new gas-exploring basin. The Arkoma map was shown at the recent Arkoma basin symposium held in Norman in March. To those who are working in this significant new gas domain, this map will be of aid.

Kentucky well slated to test Cambro-Ordovician

In Elliott County, eastern Kentucky, United Fuel Gas Co. is drilling at 3,015 ft. at its wildcat 1 Ada Pennington located 1,750 ft. FEL and 5,325 ft. FSL 21-T-77. Test is designed to explore a portion of the Cambro-Ordovician section. The well is about 1 mile northeast of a dry hole drilled by the same company in 1960, which penetrated Precambrian sediments at a total depth of 5,394 ft.

In Green County, Kentucky, oil field where the shallow pay has by now been fairly well defined and development progressing at a minimum, some attention is being given to the possibility of locating deeper reserves. A current wildcat of interest is that of Moore Oil Co. at its 1 Carl Perkins, located 9,075 ft. FWL and 8,850 ft. FSL of I-48. Although information is tight, current depth is estimated to be below 4,500 ft. The Ordovician Pencil Cave formation is reported to have been encountered at 1,224 ft.

West Virginia drilling program to start soon

A 10-well development-drilling program will be started about April 15 by Merchants Petroleum Co. on gas holdings in Clay County, West Virginia.

Merchants, a Los Angeles firm, plans to drill to the Big Injun sands found at about 2,000 ft. and to test the Weir zone which is encountered about 150 ft. below Big Injun.

The company completed three wells on the property in 1960. Gas is under contract to Equitable Gas Co. at a wellhead price of 25 cents per 1 M.c.f.

Cypress producer finaled in Jasper County, Illinois

In Jasper County, Illinois, Whaley Oil Corp. completed 1 Beulah Cornwell in SW NE SE 19-5n-8e, 1½ miles northwest of Ingraham. The well pumped 65 bbl. per day after fracture in the Cypress sand at 2,550-57 ft.

Wayne County. Peake Petroleum Co. 1 Lawrence, 2 miles east of Sims in SE NW 11-2s-6e, tested 6 bbl. of oil per hour from Warsaw at 4,154-61 ft. before shutting down due to weather. Location is ¾ mile from production.

Franklin County. The 1 Gardner Heirs Community well in SE NW NE 24-7s-2e, completed by William E. Lampley, made 273 bbl. per day, pumping and flowing after acid treatment in the O'Hara lime at 2,750-70 ft. Location is in West Frankfort, over ½ mile from O'Hara production.

Clay County. Louis Sylvester 1 Schnepper-Hastings Community, NW SE NW 22-4n-7e, 2 miles west of Sailor Springs, recovered oil on a drill-stem test in the McClosky at 2,961-74 ft. Casing is set to test at 2,964-72 ft. The well is one location south of McClosky production.

Hamilton County. Texaco Inc. is testing O'Hara at 3,137-58 ft. at 10 O. Irvin NCT-1, 2 miles southwest of Dale in C SW SE 27-6s-6e. Swab got 23 bbl. per hour following acidization of the McCloskey at 3,213-18 and 3,232-36 ft. It also tested 35 bbl. of oil and 45 bbl. water in 4 hours after acid in the St. Louis at 3,456-66 ft. This is the second St. Louis and the fourth McClosky well in this area.

Tule Creek adds fourth producer

MONTANA'S Tule Creek has its fourth oil producer at Murphy Corp. 2 Zimmerman in C NW SW 17-30n-48e, Roosevelt County.

The well flowed 316 bbl. of oil and 1 bbl. water daily through 9/64-in. choke from Nisku Devonian perforations at 7,710-14 and 7,690-98 ft. This is Murphy's third producer in the field, opened last January. It is the northeast offset to the 1 Stetvold, field discovery, and a southeast offset to 2 Sletvold in SE NE 18-30n-48e. which pumped 145 bbl. of oil and 356 bbl. of water daily from perforations at 7,685 and 7,688 ft. Flow at the 1 Sletvold discovery was 476 bbl. of oil per day, 0.1% b.s. and w., through 14/64-in. choke. Tule Creek's other producer is Placid Oil Co. 1 Lough in C SE NW 13-30n-47e. It flowed 600 bbl. per day through 12/64-in. choke from perforations at 7,624-46 ft.

Wide spacing. The Montana Oil & Gas Conservation Commission has approved 160-acre spacing for Tule Creek. Permitted well location for each spacing unit is to be in the approximate center of the southeast quarter of each unit, with a tolerance of 200 ft. in any direction. Tule Creek is lined up as follows: all 12, 13, 14, E½ 22, all 23 through 26, E½ 27, E½ 34, all 35 and 36-30n-47e; all 7, 8, 17-20, W½ 20, and W½ 31-30n-48e; all 1, 2, E½ 3, N½ 11, NW 12-29n-47e; W½ 6-29n-48e.

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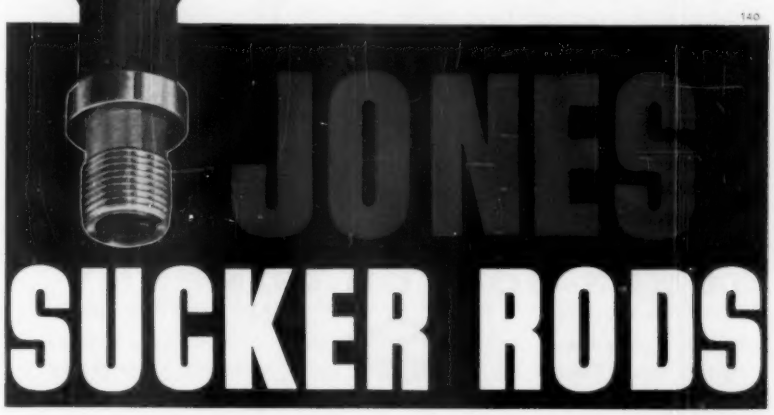
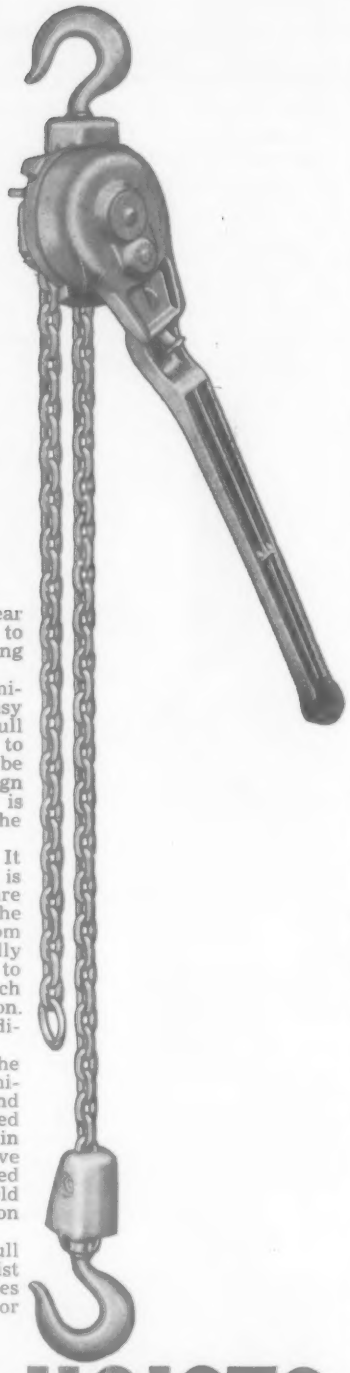


Again Coffing Brings You a New Line of Hoists



For the second time in less than a year Coffing has introduced a new hoist line to give you easy, safe, positive efficient lifting power at moderate cost.

The new RA Series Safety Pull Aluminum Ratchet and Pawl Lever Hoist is easy to operate—requires minimum handle pull—only 59 pounds for the ¾-ton model to 97 pounds for the 6-ton model. It may be operated from either side and the design prevents freezing a load. Load rotation is easy because of ball thrust bearings in the load hook assembly.

Safety has been built into the hoist. It will not ratchet under load if handle is released nor will it free chain. Controls are protected from inadvertant shifting. The bottom stop eliminates any hazard from the handle being released unintentionally and prevents handle from being moved to a position parallel to the load chain which would develop undesirable twisting action. The exclusive safety handle bends to indicated overload.

Strength without excess weight in the new hoist is achieved by a special aluminum alloy which is used in the body and handle. Long service life has been provided by the high tensile material in the chain retaining guide, heat treated load sheave and the plated, high tensile, heat treated alloy steel link chain. Maintenance is held to a minimum by the rugged construction and simplicity of design.

The new Coffing RA Series Safety Pull Aluminum Ratchet and Pawl Lever Hoist is available in six models with capacities from ¾ to 6 tons. Ask your supply store or write for Bulletin ADH-86B.

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New Mexico gets another gas find

SOUTHEAST New Mexico has another Morrow Pennsylvanian gas discovery. Newest addition to the growing list is George R. Brown 1 Humble-Federal, 10 miles southwest of Dayton in 17-20s-25e, 2¼ miles northeast of an 11,850-ft. dry hole and 10 miles southwest of McMillan field.

The discovery was completed flowing 3,050 M.c.f.d. from perforations at 9,346-9,434 ft. There is no other deep production in the area.

Delaware basin. Atlantic Refining Co. 1 Wilbanks-Hersheynson Gas unit, a 17,200-ft. wildcat 30 miles west of Fort Stockton in Pecos County, West Texas, is below 15,344 ft. after getting gas on a drill-stem test in an unknown zone. The test at 15,169-15,344 ft. got 590 M.c.f.d. Location is 1 mile northwest of the discovery well of Hershey multipay gas field in Section 7, Block 51, T-10, T&P Survey.

Hershey field. Atlantic is still testing at 1 Lucas-State, the discovery well 2 miles east of Hershey field. It flowed 2,500 M.c.f.d. from perforations in the Fusselman Silurian at 16,350-16,590 ft. From Montoya Ordovician at 16,920-17,015 ft. the well flowed 2 M.M. c.f.d., making it the deepest production yet found in Texas. This well is in Section 8, Block 50, T-10, T&P Survey, 29 miles west of Fort Stockton.

Test revives interest in Albion, Michigan

Prospect for revived development in the Albion area on the Scipio trend in southern Michigan held new promise with McClure Oil Co. 1 Legg, SE SW SW 28-2s-4w, Sheridan Township, Calhoun County, flowing 40 bbl. per hour on drill-stem test in Trenton at 4,179-4,209 ft. It is the farthest-north producing prospect in Albion pool.

Operators are hopeful the test will lead to a continuation northwest of the trend to the rather limited Sheridan-19 pool, 1½ miles northwest from Albion.

Generally, Michigan is worrying through one of its quietest periods in 3 years with only 37 scattered rigs—13 of them rotary—active. Without pressing drilling commitments, most companies are marking time to avoid early spring road and lease problems.

Five more completions added to Ohio's Hocking

In Ohio, the interest spot in the search for Pennsylvanian-grade crude continues to be the area north of Logan in Hocking County. Five more completions have been added to this play.

An eastward stepout in Falls Gore Township, Stewart Oil Co. 1 J. Wolfe, Section 30, had 100 bbl. of oil and 1,500 M.c.f.d. of gas. A ¾-mile extension in Green Township, Rixleben, Inc., 1 N. E. Adcock, Section 34, was estimated at 1 M.M.c.f.d., and 2 bbl. oil per day. In Marion Township, Wood River, Inc. 2 H. Derr, Section 24, tested 20 bbl. and 50 M.c.f.d. Two completions in Falls Township, Emme Oil Co. 4 C. J. Iles, Section 1, and Vanderman Oil 2 T. A. Ucker made 50 and 70 bbl. oil per day, respectively. The Clinton sand in these wells was topped at about 2,800 ft.

New booklet available

"Leasing and Operating Oil and Gas Lands owned by the Commonwealth of Pennsylvania," by Hugh Brinton Montgomery, is a new booklet designed to aid anyone interested in state-owned land but has been made broad enough to aid the analysis and development of oil and gas throughout the state.

Oil and gas exploration is encouraged on nearly 3 million acres of publicly owned land in Pennsylvania. These lands are under the jurisdiction of two separate state agencies. The Department of Forests and Waters controls about 2 million acres, The Game Commission has 900,000 acres. An additional 570 acres of Lake Erie acreage is under the jurisdiction of the Department of Forests and Waters. This booklet may be obtained by writing Hugh B. Montgomery, Chief, Division of Minerals, Department of Forests and Waters, Harrisburg.

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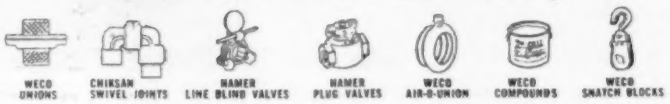

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TYPICAL DESERT and mountainous terrain of Jordan taken from 32,000 ft., covers more than 80 square miles.

PILOT - PHOTOGRAPHER team use precise new mapping cameras.

UMBRELLAS shade sensitive survey instruments as ground control crew covers desert area.

uses aerial survey to map Jordan

BEDOUIN tribesmen aid surveyers.

NEW MAPS and photos for the ancient, trackless desert lands of Jordan will be produced by a swift aerial survey by Aero Service Corp., Philadelphia.

About 30,000 sq. miles of the Hashemite Kingdom of Jordan will be mapped from a height of 6 miles. The $760,000 contract is being financed by the U. S. International Cooperation Administration.

Dr. Hazem Nuseibeh, Secretary-General of Jordan's Development Board, said the survey will help speed the nation's development. The aerial photography will aid new mineral and petroleum studies and will be the base for topographic maps to aid highway location and general planning.

Some of the most rugged desert in the world will be covered by the air mapping crew and field survey teams. Only sparsely inhabited by roving Bedouin tribes, this never - before - mapped eastern Jordan area presents major logistical problems for the 50 men who will make the essential ground measurements for the air survey. Food, gasoline, and even water must be carried along; advance survey bases will be supplied by air drop.

Team. Aero Service engineers will team with the lands and surveys department of the Jordanian Government to carry out the field work. They will rely heavily on nomadic Bedouins for aid in traversing the desert and locating the few oases and key landmarks.

First maps will be delivered early in 1963. A total of 147 map sheets, at a scale of 1:50,000 with 20-m. contours, will be delivered by the end of the year. Each 22-by-29-in. map, printed in four colors, will cover 250 sq. miles.

Air photos will be processed immediately at the survey base in Ammam, Jordan's capitol city. The field data and photos will be sent to the Philadelphia headquarters of the international air-survey organization for the map compilation with advanced stereoplotting methods. This 3-year survey project would require more than 20 years if done entirely by ground surveys, according to Aero engineers.

Devonian discovery finaled in Texas' Crane County

Devonian production was opened in southwestern Crane County, West Texas, 6 miles northwest of Imperial, at Hill & Meeker and F. W. Holbrook, Inc., 2-23 Texas American Syndicate.

The discovery flowed 162 bbl. of oil per day through 24/64-in. choke. Gravity is 38.2°. Production is from perforations at 5,770-71 ft. Location is in Section 23, Block 4, H&TC Survey, 2½ miles north of Atapco-Devonian field. The offset well and confirmation discovery, 3-23 Texas American Syndicate, Section 23, Block 4, H&TC Survey, was completed flowing 185 bbl. of 38.4°-gravity oil per day through 16/64-in. choke from perforations at 5,762-71 ft.

Triple completion reported in Palo Duro basin field

A triple completion in the Osage, Palo Pinto, and Mississippian is reported in Conley Osage field, 6 miles southeast of Quanah in Hardeman County, northwestern Texas.

This important new well is Phillips Petroleum Co. 1 Conley "A," Section 82, Block H, W&NW Survey, A-894. The well flowed 151 bbl. of oil daily through 20/64-in. choke from Osage at 8,118-23 and 8,126-32 ft. From Palo Pinto, flow was 130 bbl. per day through 10/64-in. choke from perforations at 5,235-65 ft. From Mississippian at 8,004 to 8,100 ft., flow was 144 bbl. per day on 16/64-in. choke.

Discovery wells

CALIFORNIA

Kern County:

Standard Oil Co. of California 17 "21 B" NW SW SW 21-31s-23e. Completed flowing 333 M.c.f.d. through 12/64-in. choke from 2,053-63 ft. TD 3,506 ft. New pool discovery (second Mya Zone) in Buena Vista field.

Yolo County:

Artnell Co. 1 RUSA-Lederer unit, center E½, NW¼ 2-10n-14w. On 8-hour drill-stem test flowed 1,050 M.c.f.d. through ¼-in. choke with recovery of 869 ft. of gassy mud and condensate.

Alaska exploration data

	1960	1959
Geologic field party weeks	246	552
Seismic crew months	40	92
Gravity crew months	4.85	7.5
Total footage drilled	260,341 ft.	137,902 ft.
No. of drilling permits issued	30	16
No. of wells spudded	26	16
No. of wells completed	25	12
Est. expenditure for exploration, development, production	$35,000,000	$30,654,000

Information from Alaskan State Division of Mines and Minerals.

Perforations at 8,674-80 ft. and 8,715-25 ft. Deep pool discovery in Dunnigan Hills field.

COLORADO

Baca County:

Keith L. Rising et al. 1 Burchfield, C NE SW 4-32s-43w. IPF 2,500 M.c.f.d. Topeka 3,245-58 ft. TD 3,450 ft. Topeka discovery, new field.

Horizon Oil & Gas Co. 1-10 Lepel, C NE NE 10-32s-44w. IPCAOF 2,225 M.c.f.d., SITP 7 days, 437 psi. lower Topeka 3,324-32 ft. TD 5,661 ft.

Montezuma County:

Thomas L. Nabers 2 Rowley, OWWO OTD 5,719 ft. IPP 5 BOPD, 12 BWPD, 70% cut, Paradox 5,666½-69½ ft. TD 5,726 ft. Paradox discovery, new pay.

San Miguel County, Egnar Unit:

Belco Petroleum Co. 1 unit, C SE NE 30-44n-19w. IPF 11,700 M.c.f.d., open flow, shut in. Mississippian 9,116-9,296 ft. TD 9,642 ft. Mississippian discovery, new field.

MONTANA

Roosevelt County, Tule Creek area:

Placid Oil Co. 1 L. W. Lough, C SE NW 13-30n-17e. IPF 600 BOPD, no water, 45°, 12/64-in. choke, Nisku Devonian 7,624-46 ft. TD 7,730 ft. Devonian discovery, new field.

NORTH TEXAS

Jack County:

Davenport Conglomerate field, John W. Harris Drilling Co. 2 H. Davenport, 2 miles east of Gilley Caddo and Conglomerate field in De Lagarza Sur., A-230. IPF 135 BOPD, 14/64-in.

Young County:

Sinclair Oil & Gas Co. 1 J. W. Akers, 2 miles northwest of Regular field production in William Dunn Sur., A-83. IPF 115 BOPD, 28/64-in. choke, 42.6°, GOR 595:1, TP 35 psi., packer, Miss. 4,428-39 ft.; IPF 44 BOPD, ¼-in. choke, 40.2°, GOR 12,660:1, TP 480 psi., CP 450 psi. Bryson sand 3,253-56 ft. TD 4,625 ft. Dual oil discovery.

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Reader Service Department

The OIL and GAS JOURNAL

P. O. Box 1260, Tulsa 1, Okla.

February footage breakdown

	Field wells					Wildcats			
	Oil	Cond.	Gas	Dry	Service	Oil	Cond.	Gas	Dry
Alabama	69,206								
Alaska	11,384		6,026						12,135
Arizona									1,214
Arkansas	71,765		5,874	43,815		3,310		9,395	20,389
California	243,959		54,775	53,471	8,451			42,536	58,199
Colorado	15,210		20,629	45,918		9,852		18,877	84,280
Florida									20,004
Illinois	106,882			57,107	104,969	6,966		1,878	37,596
Indiana	19,860		102	23,507				391	7,298
Kansas	388,567	5,769	44,871	241,160	68,385	35,877		32,502	242,139
Kentucky	23,686		24,970	26,071	4,050			1,610	5,628
Louisiana	320,949	12,542	167,328	369,475			27,379	937	185,851
North	88,772		66,805	65,737				937	37,895
South	173,683	12,542	75,938	263,226			27,379		134,312
Offshore	58,494		24,585	40,512					13,644
Michigan	55,881		14,262	42,785		9,614			33,860
Mississippi	131,451		13,855	89,127		13,017			130,933
Missouri									9,098
Montana	31,858			33,387					103,635
Nebraska	93,782			34,372		10,370			99,305
New Mexico	316,038		150,442	54,229	3,306	57,045		6,370	59,824
West	84,718		135,351	9,092				6,370	2,834
East	231,320		15,091	45,137	3,306	57,045			56,990
New York	19,875			2,650	14,575				
North Dakota	60,698				14,575	13,860			20,269
Ohio	136,650		71,675	27,366	2,549	4,349			2,636
Oklahoma	703,299	33,241	161,802	352,076	143,303	48,710	10,428	47,550	189,562
Oregon									9,579
Texas	1,978,100	223,940	194,522	745,236	83,173	62,791			828,717
Dist. 1	43,727	16,013		17,846					73,860
Dist. 2	57,677	38,690	4,275	64,751					86,404
Dist. 3	100,734	30,404	11,431	125,316					152,433
Dist. 4	115,581	17,025	41,328	90,560	9,800				42,397
East	180,234	14,647		63,757					44,781
Dist. 7-B	193,028		18,846	78,607	2,275	12,765			123,664
West	860,072	72,539	14,265	151,265	60,538	38,938			245,869
Dist. 9	244,405	17,812	3,250	114,971	8,048	11,088			31,944
Dist. 10	182,642	16,810	101,127	38,163	2,512				27,365
Utah	48,725		5,398	1,722	5,866	7,700			29,925
Washington									3,944
West Va.	18,909		165,923	23,240					
Wyoming	115,213		49,447	36,537	19,960	6,345	11,474	5,020	157,209
Total U. S.	**4,981,947**	**275,492**	**1,151,901**	**2,318,004**	**458,587**	**289,806**	**49,281**	**167,066**	**2,353,229**
Cum. 1961	**11,670,381**	**1,392,621**	**2,684,341**	**5,433,517**	**848,182**	**696,836**	**192,142**	**356,268**	**5,790,231**
Western Canada	517,387		79,504	93,589	26,591	21,766		56,998	342,751
Alberta	408,699		145,365	141,499	45,923	18,506		35,256	234,191
Sask.	108,688			25,058		3,260			11,211
Manitoba									2,620
B. C.			25,768					21,742	75,523
N. W. T.									19,206
Cum. 1961	**1,032,714**		**175,586**	**193,529**	**45,923**	**61,418**		**134,603**	**550,007**

choke, TP 750 psi., packer, 41°, GOR 1,750:1. Bend Conglomerate 5,770-80 and 5,823-32 ft. TD 6,020 ft. New oil discovery.

SOUTHWEST TEXAS

Bastrop County:

Murchison & West 1 Fred Hilbig, Jacob C. Lentz Sur., 4 miles northeast of Red Rock. IPP 10 BOPD (net), 5% water, 36°, perf. 1,676-88 ft., Navarro. TD 1,725 ft. Discovery well of South Hilbig field.

Gonzales County:

Superior Oil Co. 1 Georgia Dubose, Isaac Baker Sur., A-535, 9 miles southeast of Smiley. IP 2,320 M.c.f.d., 57 BCPD, 31.3% water, 12/64-in., 50.8°, TP 3,470 psi., perf. 12,064-12,138 ft., Edwards. TD 12,574 ft. New Deep Edwards field.

Hidalgo County:

Coastal States Gas Producing Co. 1-A N. R. Murchison, Block 8, Homeville Associated Subd. "D," Porcion 76, 2 miles north of Penitas. AOF 3 M.M.c.f.d., dry gas. Shut-in TP 2,000 psi., perf. 6,100-6 ft., TD 8,012 ft. New pay in North Tabasco field.

Bright & Schiff 1 Shary unit, Lot 59-3, West Sharland Subd., Porcion 54, 9 miles south of Mission. Shut-in gas-condensate well, no gage, perf. 11,317-24 ft. and 11,350-56 ft., Vicksburg V-2 sand. TD 11,420 ft. New pay and extension in Oblate area.

Webb County:

E. J. Pearl et al. 1-B O. W. Killam, Section 1569, 22 miles east of Laredo. IPP 21 BOPD (net), 52% water, 22°, perf. 1,208½-11½ ft., Yegua. TD 1,213 ft. New pay in Presa de Ora field.

UTAH

Grand County, Cisco area northwest:

Raphael Pumpelly 1 Fee, NE NE 8-20s-24e. IPF 50 BOPD, 15/64-in. choke, 40.8°, CP 150 psi. Brushy basin 1,579-96 ft. TD 1,612 ft. Brushy basin discovery, new field.

Mesa County:

United Producing Corp. 1-34 Government, SE NW 34-9s-98w. IPF 500 M.c.f.d., Corcoran 2,040-50 ft. TD 2,304 ft. PBTD 2,063 ft. Corcoran discovery, new field.

Uintah County, Island Unit:

Mountain Fuel Supply Co. 1 Island unit, SE SW 7-10s-20e. IPF 23 M.M.c.f.d., open flow, SICP 2,107 psi., SITP 2,100 psi., Wasatch Tertiary 5,487-5,569 ft. TD 9,441 ft. Wasatch discovery, new field.

(Continued on Page 176)

February well completions in the U. S.

	All wells											Wildcats							
	Total	Oil	Cond.	Gas	Dry	Service	Footage	Cum. wells 1961	Cum. footage 1961	Cable-tool comp.	D.D.	Total	Oil	Cond.	Gas	Dry	Footage	Cum. wells 1961	Cum. footage 1961
Alabama	6	6	0	0	0	0	69,206	12	137,571	0	0	0	0	0	0	0	0	2	22,815
Alaska	3	1	0	1	1	0	29,545	4	40,375	0	0	1	0	0	0	1	12,135	1	12,135
Arizona	1	0	0	0	1	0	1,214	3	3,666	0	0	1	0	0	0	1	1,214	2	2,396
Arkansas	43	22	0	3	18	0	154,548	82	321,272	0	0	9	1	0	2	6	33,094	22	87,998
California	106	69	0	14	20	3	461,391	279	1,144,795	0	11	18	0	0	6	12	100,735	38	218,882
Colorado	40	5	0	11	24	0	194,766	103	492,711	0	0	22	2	0	5	15	113,009	60	287,533
Florida	2	0	0	0	2	0	20,004	4	45,650	0	0	2	0	0	0	2	20,004	4	45,650
Georgia	0	0	0	0	0	0	0	1	4,500	0	0	0	0	0	0	0	0	1	4,500
Illinois	159	45	0	1	55	58	315,398	335	664,639	29	9	31	2	0	1	28	46,440	67	105,865
Indiana	39	12	0	2	25	0	51,158	116	168,403	20	1	10	0	0	1	9	7,689	24	23,173
Kansas	412	191	1	21	147	52	1,059,270	855	2,121,127	111	0	80	10	0	6	64	310,518	163	645,773
Kentucky	53	13	0	9	29	2	86,015	181	278,099	35	0	5	0	0	1	4	7,238	18	25,841
Louisiana	169	59	3	31	76	0	1,084,461	555	4,218,201	0	0	22	0	2	1	19	214,167	74	705,750
North	84	34	0	23	27	0	260,146	210	721,095	0	0	7	0	0	1	6	38,832	29	168,776
South	72	19	3	6	44	0	687,080	270	2,689,735	0	0	14	0	2	0	12	161,691	42	500,821
Offshore	13	6	0	2	5	0	137,235	75	807,371	0	0	1	0	0	0	1	13,644	3	36,153
Michigan	52	20	0	5	27	0	156,402	126	398,389	21	0	18	3	0	0	15	43,474	55	162,383
Mississippi	38	16	0	1	21	0	378,383	99	980,758	0	0	14	1	0	0	13	143,950	37	371,269
Missouri	4	0	0	0	4	0	9,098	9	17,599	0	0	4	0	0	0	4	9,098	8	16,205
Montana	30	8	0	0	22	0	168,880	65	319,186	0	0	15	0	0	0	15	103,635	31	169,493
Nebraska	54	27	0	0	27	0	237,829	106	503,235	0	3	23	2	0	0	21	109,675	50	240,079
Nevada	0	0	0	0	0	0	0	7	9,595	0	0	0	0	0	0	0	0	7	9,595
New Mexico	134	77	0	26	30	1	647,254	269	1,377,078	32	0	25	8	0	1	16	123,239	44	235,319
West	48	18	0	23	7	0	238,365	112	580,650	8	0	4	0	0	1	3	9,204	14	46,426
East	86	59	0	3	23	1	408,889	157	796,428	24	0	21	8	0	0	13	114,035	30	188,893
New York	28	15	0	0	2	11	37,100	60	84,907	28	0	0	0	0	0	0	0	2	5,590
North Dakota	16	11	0	0	5	0	109,580	34	211,779	0	0	3	1	0	0	2	34,129	6	55,001
Ohio	93	59	0	22	11	1	245,225	171	438,884	93	0	2	1	0	0	1	6,985	7	23,101
Oklahoma	546	268	5	39	156	78	1,689,971	907	2,969,992	152	42	53	7	1	6	39	296,250	108	568,913
Oregon	1	0	0	0	1	0	9,579	1	9,579	0	0	1	0	0	0	1	9,579	1	9,579
Pennsylvania	0	0	0	0	0	0	0	110	362,346	0	0	0	0	0	0	0	0	9	64,343
South Dakota	0	0	0	0	0	0	0	2	8,924	0	0	0	0	0	0	0	0	2	8,924
Tennessee	0	0	0	0	0	0	0	12	4,598	0	0	0	0	0	0	0	0	12	4,598
Texas	949	511	26	46	336	30	4,116,479	2,271	10,282,902	21	9	167	12	0	1	154	891,508	472	2,425,518
District 1	54	27	2	0	25	0	151,446	131	388,648	0	0	17	0	0	0	17	73,860	47	195,077
District 2	32	6	4	1	21	0	251,797	115	816,041	0	1	12	0	0	0	12	86,404	26	187,942
District 3	62	19	3	3	37	0	420,318	174	1,278,740	0	0	17	0	0	0	17	152,433	46	425,302
District 4	60	22	2	7	25	4	316,691	209	1,228,734	0	4	9	0	0	0	9	42,397	49	269,281
East (5 & 6)	64	38	2	0	24	0	303,419	175	861,406	0	0	12	0	0	0	12	44,781	40	186,988
District 7-B	147	76	0	6	62	3	429,185	316	959,287	9	0	36	4	0	0	32	136,429	85	325,715
West (7-C & 8)	268	168	8	5	69	18	1,443,486	561	2,915,559	12	4	47	5	0	1	41	284,807	113	586,613
District 9	177	110	3	1	59	4	431,518	379	943,062	0	0	11	3	0	0	8	43,032	49	140,594
District 10	85	45	2	23	14	1	368,619	211	891,425	0	0	6	0	0	0	6	27,365	17	108,006
Utah	18	10	0	1	6	1	99,336	34	192,521	0	0	7	2	0	0	5	37,625	20	114,246
Washington	1	0	0	0	1	0	3,944	2	6,569	0	0	1	0	0	0	1	3,944	2	6,569
West Virginia	85	7	0	68	10	0	208,072	168	409,479	85	0	0	0	0	0	0	0	0	0
Wisconsin	0	0	0	0	0	0	0	6	8,100	0	0	0	0	0	0	0	0	6	8,100
Wyoming	77	24	1	10	38	4	401,205	166	827,090	0	4	34	1	1	1	31	180,048	70	348,341
Total February 1961	**3,159**	**1,476**	**36**	**311**	**1,095**	**241**	**12,045,313**	**7,155**	**29,064,519**	**627**	**79**	**568**	**53**	**4**	**32**	**479**	**2,859,382**	**1,425**	**7,035,477**
Total January 1961	3,996	1,745	135	389	1,512	215	17,019,206	....	.....	787	59	857	69	15	30	743	4,176,095	....	.....
Cumulative 1961	**7,155**	**3,221**	**171**	**700**	**2,607**	**456**	**29,064,519**	....	.....	**1,414**	**138**	**1,425**	**122**	**19**	**62**	**1,222**	**7,035,477**	....	.....
Cumulative 1960	7,285	3,364	232	640	2,801	248	31,140,089	....	.....	....	....	1,617	152	15	52	1,398	7,346,600	....	.....

Wall of Caloil Sets Example

. . . of hard work for his associates. He's been a man on the go throughout a 27-year sales career with Socal.

THE MAN heading the eastern market drive of Standard Oil Co. of California is E. E. (Al) Wall, president of California Oil Co. Eastern Division, whose 27-year Socal sales career started in the fiftieth state.

Born in Honolulu in 1915, Wall is the son of Hawaii's surveyor general, who mapped the Hawaiian Islands.

Wall attended the University of Hawaii, University of Oregon, and University of Southern California, majoring in business administration. On leaving college in 1934, he picked Socal as an employer on the recommendation of a friend.

Wall joined Standard as a plant man at a Honolulu bulk plant and held various sales jobs in Hawaii for the next 9 years, rising to branch manager at Kahului, Maui.

He came to the mainland in August 1943 as branch manager at Bakersfield, Calif. He was successively assistant district manager at Oakland, district manager at Bakersfield, and regional manager at Fresno. He was transferred to California Oil as general sales manager at the Perth Amboy, N. J., headquarters in March 1956.

E. E. WALL
. . . Socal was recommended.

A year later he was made vice president of marketing for Caloil, and in April 1958 he was elected president.

The executive . . . Wall is big and athletic. He was a football player, track man, and swimmer in college, and still keeps fit by hunting and playing golf.

He relaxes easily, but believes in hard work. He arrives at the office by 8:30 a. m., which is early by standards in the New York area.

Many oil-company presidents get away from the job for an hour or so of relaxation at noon. But Wall usually eats a sandwich during a 25-minute visit to the company cafeteria in the basement of the Perth Amboy headquarters. He makes exceptions for important customers or parent-company brass and lunches with them outside the building.

Wall usually carries home a briefcase load of reports for after-dinner reading.

He has the reputation among colleagues of being able to lead without dominating.

Since entering the East immediately after World War II, Caloil has rapidly expanded its position in a 13-state market area, and now ranks as a major refiner and marketer. Under Wall, it is running the Perth Amboy refinery near its 100,000-bbl. daily capacity, and has an expansion policy for the future.

▶▶▶ Personals

J. M. Goff, general superintendent of construction in Dow Chemical Co.'s Louisiana division, Plaquemine, has been transferred to the new engineering and construction-services division as resident superintendent in Plaquemine. **A. F. DeCesare** and **T. B. Jordan, Jr.,** area engineers in construction, Louisiana division, have been transferred to the new division as field engineers. They will continue to headquarter in Plaquemine.

Lee Powell and **W. E. Goad,** petroleum engineers, have joined Ramsey Engineering, Inc., Oklahoma City petroleum consulting firm. Powell formerly was with Texaco in Houston. Goad was with Pan American Petroleum Corp. in Liberal, Kans. They will headquarter in Oklahoma City.

J. T. Crooker, district superintendent in Anchorage, Alaska, for Standard Oil Co. of California, Western Operations, has been named manager of the production department's southern division. He will headquarter in La Habra, Calif. Crooker succeeds **W. C. Johnson,** who will retire May 1 after 45 years with the company. **C. V. Chatterton,** district superintendent of production in Red Wash, Utah, for California Oil Co., will succeed Crooker in Anchorage.

J. F. Flanagan, senior engineering supervisor in the engineering department of Monsanto Chemical Co.'s plastics division, has been appointed technical director of Monsanto Iberica, SA, with headquarters in Barcelona, Spain. Flanagan will be responsible for the research, development, engineering, and manufacturing departments.

Gavin Witherspoon has resigned as Middle East representative for Getty Oil Co. in Jeddah, Saudi Arabia, and moved to Beirut, Lebanon. Witherspoon was vice president and general manager of American Independent Oil Co., Kuwait, and had been with Bahrain Petroleum Co. in New York before joining Getty.

Edward C. Dorroh has joined Loffland Brothers Co. as contract manager of the Rocky Mountain division. He will headquarter in Denver. Dorroh is a former vice president of Tradewinds Exploration.

Robert Lampkin, Bakersfield, Calif., vice president and general manager of Petroleum Technologists, has joined Oilwell Research, Inc., Long Beach, Calif. He will temporarily remain in Bakersfield with Oilwell Research.

Personals

W. J. Harkey, resident manager in Tripoli, Libya, for Namco International, Inc., Dallas geophysical company, has been named resident manager in Adelaide, South Australia. He will supervise seismic exploration program which Namco will conduct for Delhi Australian Petroleum, Ltd. Namco is an affiliate of National Geophysical Co., Dallas; Continental Geophysical Co., Fort Worth; and E. V. McCollum & Co., Tulsa.

H. H. Raborn, treasurer and assistant secretary of Kerr-McGee Oil Industries, Inc., has been named vice president and general manager of marketing, a new position. **F. C. Love,** executive vice president, has taken on added responsibilities for refining, crude-oil supply, and pipeline transportation operations. **D. A. Watkins,** controller, has been named to succeed Raborn as treasurer and assistant secretary, and **Paul Puttroff** will succeed Watkins. **Leo Garwin** has been given responsibility for sale of helium from Kermac's Pinta Dome plant, now under construction.

G. R. L. Shepherd has been named assistant division head, manufacturing research and development, at Humble's Baytown, Tex., refinery. He will be responsible for research on fuels. **Bartlett Johnston** has been promoted to staff engineer in the technical division at Baytown.

J. A. Stoll, manager of the supply and distribution department of Standard Oil Co. (Ohio), has been named manager of the new supply and transportation department. **H. W. Pattison,** manager of the transportation department, has been named planning coordinator for petroleum business activities. In the new supply and transportation department, **J. R. Shipley,** assistant to the transportation department manager, has been named assistant to Stoll. **J. R. McCreary,** manager of supply coordination, has been named manager of the supply division, crude oil and products. **C. R. Elder,** general superintendent in the transportation department, has been named manager of the transportation division. **R. F. Dudley** will continue as manager of traffic and his operations have been moved to the transportation division. **C. E. Curry** will continue as manager of the purchasing division.

J. Frank Wilson has resigned as vice president in charge of crude-oil purchases and sales for Standard Oil Co. (Ohio). He will move from Cleveland to Houston, where he will act as consultant to the company. Wilson has been with Ohio Standard since 1935 and has been a vice president since 1957.

Fred J. Wellington, manager of manufacturing at the Barranca, Colombia, refinery of International Petroleum (Colombia) Ltd., has joined Refineria Panama, SA, as general manager of operations. Refineria Panama, jointly owned by Continental Oil and National Bulk Carriers, Inc., has a refinery under construction in Panama.

New staff members of Esso Research & Engineering Co., Linden, N. J., are **William Brackney,** mechanical engineer in the special-projects unit; **John Harding,** chemical engineer in the central basic-research laboratories; **Jerry Hamaker,** petreloum engineer in the technical sales-service unit; and **Zisis Foroulis,** physical metallurgist, and **James Harris,** mechanical engineer, in the general-engineering division.

J. E. King, general manager of sales for Texaco Canada, Ltd., has been elected vice president, sales. He succeeds **Charles C. Dunn,** recently named managing director of Regent Oil Co., Ltd., Texaco affiliate, in London.

Four Texas oil men received citations for service at the southwestern district meeting of API's Division of Production last week in Albuquerque. They were **E. W. Showen,** Gulf Oil Corp., Houston; **R. R. McCarty,** Humble Oil & Refining Co., Midland; **Ira B. Stitt, Jr.,** Mobil Oil Co., Lubbock; and **A. A. Ashton,** Continental - Emsco Co., Dallas.

M. G. Punches, Colorado Springs, Colo., district marketing manager for Continental Oil Co., has been named manager of the new Colorado district with headquarters in Denver. Three sales areas have been formed within the Colorado district. **H. S. Campbell,** manager of the Billings, Mont., district, will head the northern sales area. **R. L. Lipson,** Pocatello, Idaho, district manager, will head the southern area, and **Richard Peate,** Denver district manager, will head the Denver area.

Evard P. Ellison, Beaumont, Tex., consulting geologist, has joined North Central Oil Corp., Houston, as chief geologist. Ellison was with Sun Oil Co. before becoming a consultant.

G. W. Robinson has been promoted to engineering associate, the top engineering classification in the technical division at Humble Oil & Refining Co.'s Baytown, Tex., refinery. He has been assigned to the new position of process-design coordinator, responsible for coordination of process design of all major projects.

Russell F. Boynton and **John Q. Adams** have been named research chemists at California Research Corp.'s Richmond, Calif. laboratory. **James N. Sullivan, John E. Schmidt** and **William A. Monge** have been named research engineers at Richmond. **J. Fred Gernert** has joined the instrument development staff at Richmond and **Philip E. Gahr** has joined Cal Research at the El Segundo, Calif., laboratory.

Ralph H. McCollister has been named manager of the project-development division in Enjay Chemical Co.'s new projects department. He had been head of the chemical technical-service department at Humble Oil & Refining Co.'s Baton Rouge refinery.

J. L. LeBlanc, east delta area superintendent for California Co. division of California Oil Co., has been named assistant superintendent of the delta-Gulf Coast division. He

succeeds **E. W. Harter,** now superintendent of the Bay Marchand area, Leeville, La. Harter replaced **Harry Dupre,** recently named assistant chief engineer, petroleum, in New Orleans. **T. H. Jackson, Jr.,** has been named superintendent of the new Venice, La., area. Also in the Venice area, **W. H. Schell** has been named production supervisor; **C. A. Lamb** has been named area drilling engineer; **W. E. McClung** has been named area construction engineer; and **R. W. Donaldson** and **Leo Fisher** have been named lead production engineers.

Shell Oil Co. has consolidated its San Francisco and Sacramento marketing divisions to form an enlarged division headquartered in San Francisco. **H. S. Haight,** manager of the old San Francisco division, and **S. K. Holt,** operations manager, will hold these positions in the new division. **R. S. Davis,** San Francisco division sales manager, has been named reseller sales manager. **J. G. Fuller,** Sacramento division sales manager, has been named sales manager, commercial.

William H. Foster, Jr., geologist with Breuer & Curran Oil Co. in Dallas, has been named district geologist for Alco Oil & Gas Corp. in Shreveport, La.

W. P. Carver, western division land man for Mobil Oil Co., has joined Great Basins Petroleum Co. as vice president and a director. Carver had been with Socony Mobil affiliates for 22 years. He was land-department manager of General Petroleum before its merger with Mobil.

Lewis E. Andrews has been named contract manager of Loffland Brothers Co.'s new central division. He will headquarter in Tulsa.

J. G. Affleck, manager of American Cyanamid Co.'s rubber-chemicals department, will take office in July as president of Commercial Chemical Development Association. **Luther R. Modlin, Jr.,** B. F. Goodrich Chemical Co., has been named president-elect. New directors are **James E. Sayre,** Allied Chemical Corp.; and **J. Kenneth Craver,** Monsanto Chemical Co.

Dr. Roy N. Giles, assistant manager of American Oil Co.'s Mandan, N. D., refinery, has moved up to manager. He succeeds **Thomas E. Stockdale,** who has retired after 38 years with the Standard Oil Co. (Ind.) companies. Stockdale was general superintendent of the Wood River, Ill., refinery before moving to Mandan in 1952.

Norman B. Clark, Jr., reservoir engineer for Union Oil Co. in Bakersfield, Calif., has been promoted to district engineer in Santa Fe Springs, Calif.

Thomas E. Moffitt, president of Hooker Chemical Corp., has been elected chairman and chief executive officer. **F. Leonard Bryant,** executive vice president, has succeeded Moffitt as president. **Thomas F. Willers,** vice president, has been elected executive vice president.

B. F. Dudenbostel, Jr., Esso Research & Engineering Co., has been elected chairman of American Society for Testing Materials' new gas chromatography committee. **C. G. Harriz,** Houdry Process Corp., has been named secretary. The group will promote development and application of gas chromatography.

H. G. McChesney, geologist with Phillips Petroleum Co., in Denver, has joined HLM Drilling Co. in Denver.

Howard L. Miller will do consulting work in Houston after his retirement from the geological department of Cities Service. He had been with the company 33 years.

Max W. Dix, geologist with Gulf Oil Corp., has been transferred to Casper, Wyo., from Billings, Mont. The Billings district office has been closed.

Kenneth E. Francis, seismic computer in the geophysical department of Texaco Inc., has been transferred to Scott City, Kans., from Liberal, Kans.

▶▶▶ Personals

Glenn L. Werly, who recently retired as special assistant to Mobil Oil Co.'s marketing vice president, has been named president of National Oil Fuel Institute, new association resulting from merger of Oil Heat Institute and National Fuel Oil Council. **Charles H. Burkhardt,** managing director of Oil Heat Institute, has been named vice president of NOFI and will head the marketing - distribution and equipment-technical divisions. **Frederick S. Burroughs,** secretary of National Fuel Oil Council, has been named managing director of the promotion-communications division and secretary of the new association. **Ralph Hartell,** National Fuel Oil Council communications director, will be NOFI communications director for all divisions.

WERLY

Morris E. Halsted, geologist in Amerada Petroleum Corp.'s foreign department, has been transferred to Tulsa from Houston.

Ralph L. Scott, geologist with Kewanee Oil Co. in Wichita, has been transferred to Tulsa as research geologist.

Harold J. Conrad, Shell Oil Co. exploitation engineer, has been transferred to Houston from Kilgore, Tex.

William Mayrsohn, Skelly Oil Co. geologist, has been transferred to Bismarck, N. D., from Wichita.

D. G. Bangert, general foreman of the operating division at American Oil Co.'s Mandan, N. D., refinery, has been transferred to the Whiting, Ind., refinery as assistant superintendent of the utilities division. **C. H. Ruzicka** will succeed Bangert at Mandan.

Allan Haven has joined American Oil Co.'s research and development department in Whiting, Ind. He will work with economic studies of new refining processes.

Personals

James H. Kercher, formerly geologist with Sohio Petroleum Co., has opened offices as consulting geologist in Oklahoma City.

H. Brewin Cheney, an assistant director of sales for Monsanto Chemical Co.'s overseas division, has been promoted to director of sales, Eastern Hemisphere.

A. M. Laurie and **Robert W. Mannon** have formed Laurie & Mannon, petroleum consulting firm in Modesto, Calif. Laurie had been with the valuation division of California State Board of Equalization and Mannon was with H. T. Olsen & Associates, Los Angeles. Both were with Gulf Oil Corp. at one time.

Michael S. Reford has been named chief geophysicist for the Aero Service Group of air survey companies. Reford joined Canadian Aero Service, Ltd., in 1956 after several years with Mobil Oil of Canada.

Joffre J. Crouere, New Orleans consulting geologist, has joined Cypress Oil Co. division of Cyprus Mines Corp. as representative in the southern Louisiana area.

Oscar Suarez, engineer with Pan American in New York City, has joined Yacimientos Petroliferos Fiscales Bolivianos, Bolivian oil agency, as superintendent in Sanandita, Bolivia.

R. D. (Dick) Michaels, formerly drilling and production superintendent for Crescent Oil & Gas Corp., has joined Steinhorst Operators' Service, Inc., Lafayette, La., consulting firm, as Ark-La-Tex area representative. He will headquarter in Shreveport, La.

O. H. Meyer, superintendent for General Crude Oil Co. in Clairemont, Tex., has retired and moved to Longview, Tex.

A. R. Marsden, exploitation engineer for Shell Oil Co. in Lafayette, La., has been transferred to Weeks Island, La., as lease foreman.

Remick McDowell, chairman of Peoples Gas Light & Coke Co., has been named to succeed **Eskil I. Bjork** as chairman of six Peoples Gas subsidiaries. The subsidiaries are Natural Gas Pipeline Co. of America, Natural Gas Storage Co. of Illinois, Peoples Production Co., Texoma Production Co., Kimswick Development Co., and Union Hill Gas Storage Co. Bjork will continue as a director.

McDOWELL

Thomas M. Curtis, assistant division engineer for Pan American Petroleum Corp. in Fort Worth, has been named district superintendent for producing activities in Farmington, N. M.

Kenneth Wilson, exploration geologist and land man with American Smelting & Refining Co. for 17 years, has resigned to open consulting offices in San Francisco.

Deaths

C. E. (Cliff) Johnson, 62, superintendent in charge of Pan American Petroleum Corp.'s Billings, Mont., district, died March 19. Johnson joined Pan Am in 1924. He had held the Billings district post since January and also had served as district superintendent in Casper, Wyo., and Cody, Wyo.

Edward S. Plank, 60, superintendent of the gas measurement department of Tennessee Gas Pipeline Co., Houston, died March 20 in Lafayette, La., while on a business trip. Plank had been with the Tennessee Gas Transmission companies since 1944.

C. Harold Gray, 49, Houston independent operator, died March 17 at his home after a short illness. Gray was with Humble Oil & Refining Co. and Ada Oil Co. before becoming an independent in 1949.

Frank Fletcher Hill, 84, retired director of production for Union Oil Co., died March 15 at his home in Los Angeles. Hill pioneered use of modern drilling and production techniques in California. His successful well cementing job in 1906 is credited with being one of the first of its type. Later he helped introduce deep rotary drilling into the state. Hill joined Union in 1895, a few years after its incorporation. He retired in 1939.

David A. Kendall, 85, early developer of California's Baldwin Hills field, died March 13.

Sherman Carl West, 73, retired Tulsa independent producer, died March 21 in a Broken Arrow, Okla., nursing home.

A. G. Wadsworth, 62, New Bedford, Mass., oil investor, died March 21 at his home of an apparent heart attack. Wadsworth was an active wildcatter in Oklahoma, Kansas, Texas, and Kentucky.

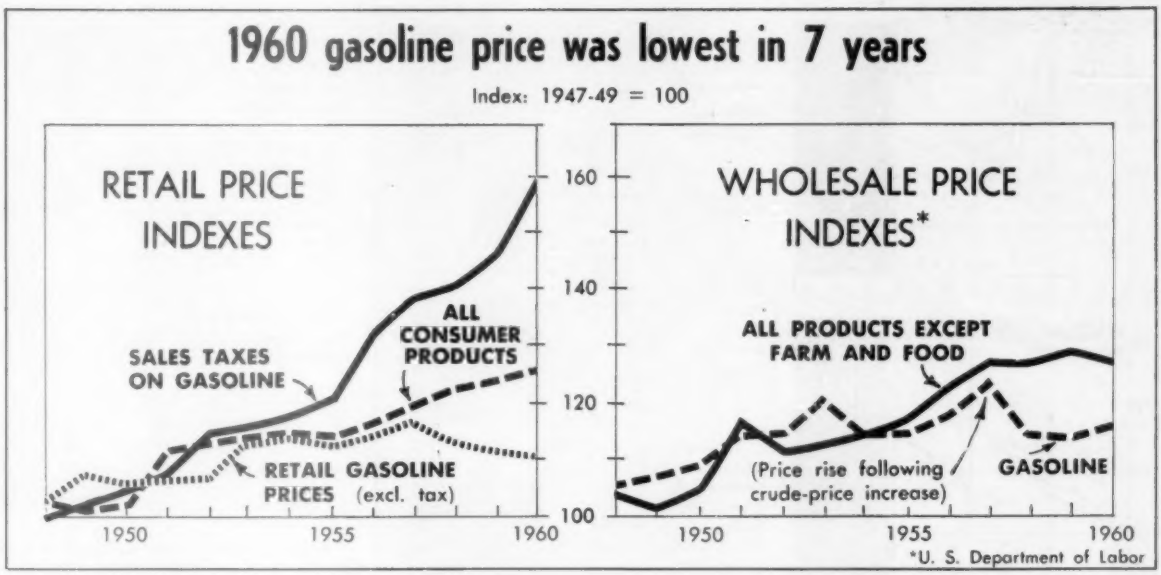
Amos Daniel Whitten, 70, retired Tulsa producer, died March 21 in a Tulsa hospital.

Max Hamilton Roberts, 69, retired vice president of Mid-Continent Map Co., Tulsa oil-lease abstract mapping firm, died March 21 in a Tulsa hospital of a liver ailment. Roberts retired in 1957 after 30 years with the map company.

Edward Leavell McDonald, 90, secretary and general counsel for Ashland Oil & Refining Co. and partner in McDonald, Alford & Roszell, attorneys, died March 15 at his home in Lexington, Ky. McDonald was one of the founders of Swiss Oil Co., a predecessor of Ashland.

Elmer E. Anderson, 85, retired field supervisor for the old Reno Oil Co., died March 10 in a Marietta, Ohio, hospital.

George A. Manahan, 79, owner of Manahan Oil Co., Tulsa production company, died March 22 at his winter home in Tucson, Ariz. Manahan worked as a driller in Ohio oil fields before he was 20. He entered the drilling contracting business in Tulsa in 1917 and was active in discovery and development of Oklahoma and Texas fields in the 1920's and 30's. In 1931 he formed the Manahan Oil Co.



Gasoline cost less in 1960. Taxes were high

BY JOHN C. CASPER

GASOLINE is a bargain at all sales levels. It would be an even bigger bargain except for the high tax rate. Let's take a look at a few comparisons. What has been the trend for retail gasoline prices in recent years? Have gasoline prices increased more than other consumer prices? What is the sales-tax rate on gasoline? Has it been increasing?

Most of these questions can be answered by the left chart above. Lines on the chart represent indexes of retail gasoline prices, general consumer product prices, and taxes on gasoline. Lines are plotted as indexes with values for 1947-49 equal to 100.

The postwar peak for gasoline prices came in 1957 after the latest general crude-price increase. Crude prices did not stay at the peak and neither did gasoline. Note the decline in price index for 1958, 1959, and 1960. The average gallon of gasoline sold at service stations in 1960 carried a price that was only 11% higher than the average for the period 1947-49. This is based on the retail price of the gasoline and does not include taxes. The average price for 1960 was lower than for any year since 1952.

You can't find many such bargains among other consumer items. The average purchase of consumer items in 1960 carried a price that was 26.5% higher than the average for 1947-49 period. In fact, general consumer prices hit a new high last year.

But for a steep upward slope, take a look at gasoline taxes. State, city, and federal taxes on gasoline were 60% higher in 1960 than in the base period. Total consumer product prices were up 26.5%, and gasoline was up only 11%.

Gasoline also has been cheap at wholesale levels, compared with other items. The United States Department of Labor reports a price-index number for wholesale gasoline each month. Again, the index is based on 1947-49 equal to 100. Lines are on right chart.

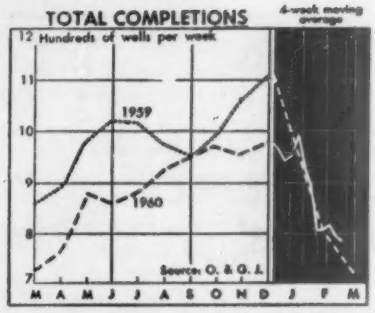
Gasoline has been 20% above the base price only twice in the past 12 years. Both followed general crude-price advances, and held for only a short period. The price index for all items other than farm products and food has been above 120 for the past 5 years.

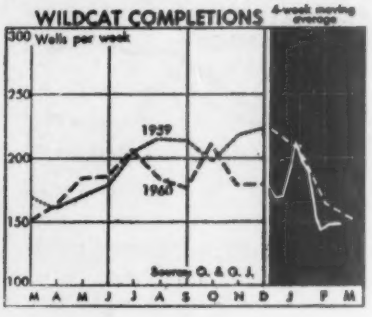
Gasoline itself is a bargain, but it was taxed at 48.3% of its value last year.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,366,700	UP	2,025	UP	301,769
Crude stocks	232,071,000	UP	2,763,000	DOWN	22,163,000
Completions	818	UP	114	UP	54
Refinery runs	8,043,000	DOWN	221,000	UP	186,000
Gasoline stocks	225,519,000	UP	866,000	UP	1,055,000
Kerosine stocks	25,240,000	UP	344,000	UP	6,456,000
Distillate stocks	95,380,000	DOWN	508,000	UP	12,938,000
Residual stocks	42,998,000	DOWN	301,000	UP	2,007,000
Four-product stocks	389,137,000	UP	401,000	UP	22,456,000
Total imports	2,148,100	DOWN	53,300	UP	190,800

Active Rotary Rigs





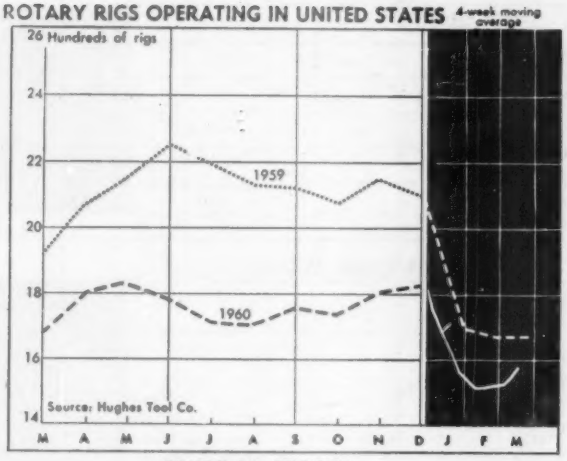
	3-20-61	3-13-61	3-21-60
Alabama	5	5	5
Alaska	7	7	(*)
Arkansas	16	14	11
Arizona	0	0	2
California	62	66	82
Land	58	62	80
Offshore	4	4	2
Colorado	20	24	23
Florida	1	1	2
Land	0	0	1
Offshore	1	1	1
Georgia	0	1	0
Illinois	17	9	18
Indiana	3	2	3
Kansas	97	107	86
Kentucky	2	1	4
Louisiana	286	268	302
North	31	25	26
S. Inland waters	112	106	130
S. Land	83	81	93
Offshore	60	56	53
Michigan	6	11	37
Mississippi	47	48	69
Montana	18	21	16
Nebraska	26	25	25
New Mexico	89	83	80
New York	0	0	2
North Dakota	21	21	19
Ohio	6	5	4
Oklahoma	193	182	176
Pennsylvania	5	4	7
South Dakota	0	0	1
Texas	639	610	622
S. Inland waters	8	9	9
S. Land	158	147	167
Offshore	3	3	2
North	60	54	42
Panhandle	52	54	55
East	59	56	42
West Central	†166	†162	205
West	133	125	100
Utah	32	30	30
Washington	1	1	0
West Virginia	4	4	5
Wyoming	53	53	52
Total U. S.	**1,656**	1,603	1,683
Cum. avg. to date	1,557	1,547	1,675
Western Canada	178	190	217
Eastern Canada	0	0	3
Grand total	1,834	1,793	1,903

Hughes Tool Co. report. *Data first reported 4-4-60. †Stephens and Eastland counties now included in West Central.

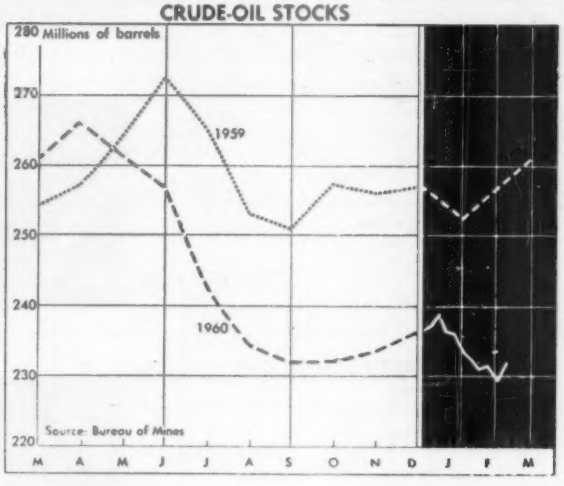
WEEKLY WELL COMPLETIONS . . . WEEK ENDED MARCH 18, 1961

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Arkansas	7	4	0	0	3	0	21,664	113	127	0	0	0	0	0	25	34
California	24	10	0	5	9	0	142,616	372	284	9	0	0	2	7	57	66
Colorado	12	1	0	2	9	0	57,017	136	156	8	0	0	0	8	77	71
Illinois	25	6	0	0	5	14	39,715	391	513	1	0	0	0	1	79	136
Indiana	7	3	0	0	4	0	9,282	140	200	2	0	0	0	2	31	81
Kansas	69	36	0	7	24	2	209,852	1,099	715	29	5	0	6	18	226	229
Kentucky	45	19	0	3	23	0	58,311	311	460	7	0	0	0	7	37	54
Louisiana	78	31	0	17	29	1	656,753	727	708	16	2	0	3	11	106	99
North	24	10	0	6	8	0	78,448	268	223	7	1	0	0	6	42	41
South	42	13	0	11	18	0	460,685	362	364	9	1	0	3	5	60	52
Offshore	12	8	0	0	3	1	117,620	97	121	0	0	0	0	0	4	6
Michigan	4	3	0	0	1	0	12,689	157	161	1	0	0	0	1	64	53
Mississippi	6	3	0	1	2	0	70,605	123	169	1	0	0	0	1	43	61
Montana	5	3	0	0	2	0	29,885	88	56	2	0	0	0	2	40	28
Nebraska	12	9	0	0	3	0	52,538	153	162	3	0	0	0	3	66	66
New Mexico	32	16	0	2	14	0	143,418	364	418	11	0	0	0	11	69	58
West	6	2	0	2	2	0	24,826	138	138	2	0	0	0	2	18	13
East	26	14	0	0	12	0	118,592	226	280	9	0	0	0	9	51	45
New York	0	0	0	0	0	0	0	147	72	0	0	0	0	0	2	5
North Dakota	3	2	0	0	1	0	15,454	47	65	1	0	0	0	1	11	11
Ohio	17	11	0	1	4	1	32,536	218	252	0	0	0	0	0	10	13
Oklahoma	176	82	1	23	54	16	548,274	1,266	817	12	2	0	1	9	138	159
Pennsylvania	50	18	0	17	6	9	149,017	152	128	0	0	0	0	0	7	6
Texas	203	112	11	10	69	1	947,265	2,930	3,489	39	3	1	1	34	621	708
Dist. 1	22	9	1	1	11	0	57,120	175	250	9	0	1	0	8	67	86
Dist. 2	9	4	1	1	3	0	61,303	139	147	1	0	0	1	0	30	38
Dist. 3	19	12	2	0	5	0	140,397	225	275	0	0	0	0	0	53	54
Dist. 4	12	7	1	0	4	0	59,716	263	271	0	0	0	0	0	58	82
East	13	7	2	0	4	0	73,127	228	265	3	0	0	0	3	50	56
Dist. 7-B	30	14	0	1	15	0	111,903	397	476	15	2	0	0	13	116	135
West	47	29	3	1	14	0	277,110	740	934	9	0	0	0	9	163	145
Dist. 9	31	19	1	0	10	1	69,543	489	635	0	0	0	0	0	61	92
Dist. 10	20	11	0	6	3	0	97,046	274	236	2	1	0	0	1	23	20
Utah	4	2	0	0	2	0	20,402	52	60	1	0	0	0	1	25	22
West Virginia	14	1	0	10	3	0	43,637	215	191	2	0	0	0	2	2	1
Wyoming	24	14	1	2	7	0	103,402	228	217	4	0	0	0	4	92	89
Misc., Alaska	1	1	0	0	0	0	10,995	72	40	0	0	0	0	0	54	20
Total U. S.	**818**	387	13	100	274	44	3,375,327	9,501	9,460	**149**	12	1	13	123	1,882	2,070
Previous week	704	323	13	92	237	39	2,908,218			130	16	0	9	105		
Cum. 1961	9,501	4,322	221	945	3,415	598	38,537,077			1,882	160	24	88	1,610		
Cum. 1960	9,460	4,414	308	841	3,605	292	41,180,434			2,070	189	20	62	1,799		
Western Canada	39	18	0	6	15	0	210,777	520	538	10	1	0	1	8	168	155

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	3-11-61	3-4-61	3-12-60
Pennsylvania	2,160	2,160	2,179
Other Appalachian	1,295	1,231	1,920
Illinois, Indiana, Michigan	9,158	9,055	9,254
Nebraska and North Dakota	3,031	3,018	2,436
Kansas	9,083	9,068	9,164
Oklahoma	14,647	14,678	17,051
Arkansas	1,689	1,657	2,023
Louisiana	18,297	17,873	19,317
North	3,047	3,323	3,180
South	15,250	14,550	16,137
Mississippi, Alabama, Florida	1,805	2,212	2,765
New Mexico	7,329	7,425	7,933
Texas	96,874	96,069	109,788
East Texas	8,493	8,447	8,206
West Texas	44,318	43,660	50,691
Texas Gulf	16,381	16,042	19,572
Other Texas	27,682	27,920	31,319
Wyoming	17,040	16,927	16,876
Other Rocky Mountain	9,928	9,429	9,584
California	24,520	24,629	29,768
Foreign	†15,215	13,857	14,176
Total	**232,071**	229,288	254,234

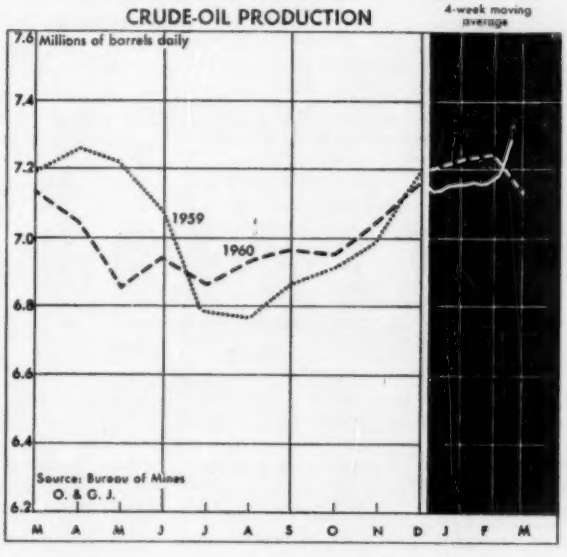
*Bureau of Mines. †Includes 5,160,000 bbl. in California.

DAILY AVERAGE PRODUCTION FOR WEEK

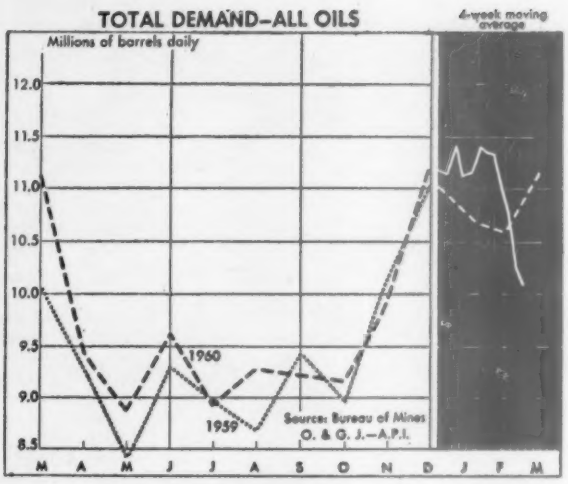
	March 18, 1961 Crude oil	Lease condensate	Total	Mar. 11 total
Alabama	20,175	.....	20,175	20,125
Alaska	10,000	.....	10,000	9,000
Arkansas	75,625	125	75,750	75,700
California	828,000	.....	828,000	827,600
Colorado	132,500	.....	132,500	131,800
Eastern	40,500	.....	40,500	40,300
Florida	1,025	.....	1,025	1,025
Illinois	209,800	.....	209,800	208,400
Indiana	31,400	.....	31,400	31,800
Kansas	†314,375	.....	†314,375	†315,850
Kentucky	56,300	.....	56,300	56,300
Louisiana	1,000,325	155,975	1,156,300	1,156,200
North	104,325	5,975	110,300	110,200
South	896,000	150,000	1,046,000	1,046,000
Michigan	52,200	.....	52,200	51,100
Mississippi	146,450	4,525	150,975	150,975
Montana	80,100	.....	80,100	81,600
Nebraska	68,400	.....	68,400	67,200
Nevada	400	.....	400	400
New Mexico	299,000	8,500	307,500	307,500
North Dakota	65,000	.....	65,000	68,100
Oklahoma	†527,700	.....	†527,700	†523,000
Texas	2,658,000	100,150	2,758,150	2,758,150
Dist. 1	44,000	3,700	47,700	47,700
Dist. 2	117,000	8,800	125,800	125,800
Dist. 3	326,000	42,000	368,000	368,000
Dist. 4	192,000	14,000	206,000	206,000
Dist. 5	29,000	500	29,500	29,500
Dist. 6	123,000	9,000	132,000	132,000
East Texas field	142,000	.....	142,000	142,000
Dist. 7-B	134,000	500	134,500	134,500
Dist. 7-C	123,000	3,850	126,850	126,850
Dist. 8	1,130,000	12,000	1,142,000	1,142,000
Dist. 9	192,000	3,800	195,800	195,800
Dist. 10	106,000	2,000	108,000	108,000
Utah	94,300	.....	94,300	98,400
Wyoming	385,100	.....	385,100	383,400
Others	‡750	.....	‡750	‡750
Total U. S.	7,097,425	269,275	**7,366,700**	7,364,675
Change from prev. week, up			**2,025**	
Canada	†516,500	.....	†516,500	†532,900
Total U. S. prod., January 1-March 18				554,999,800 bbl.
Same period last year (crude plus cond.)				*555,061,000 bbl.

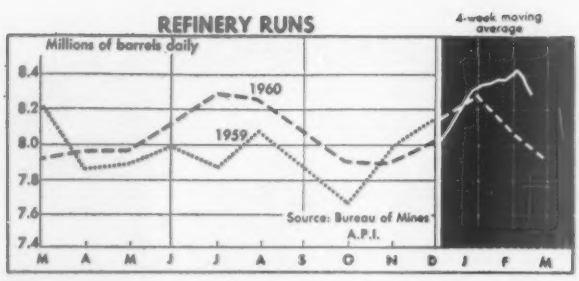
*Includes 17,629,700 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

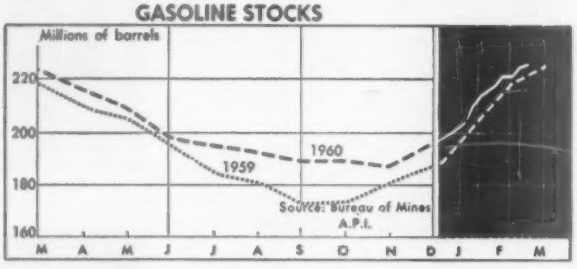
CRUDE-OIL PRODUCTION

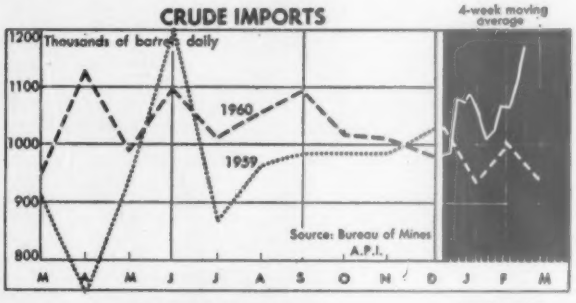


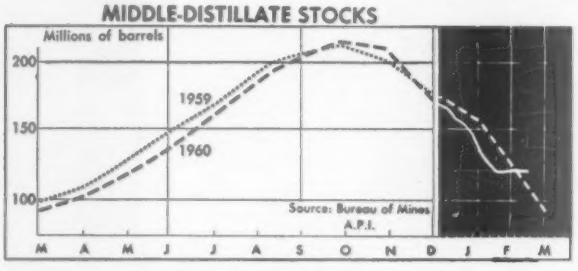
REFINING

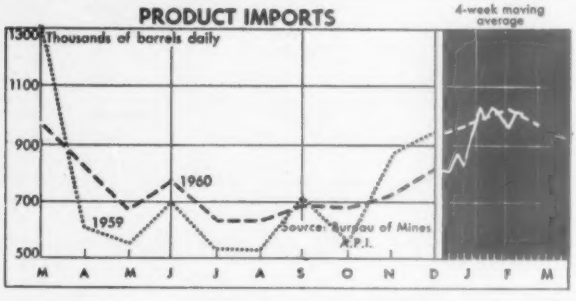


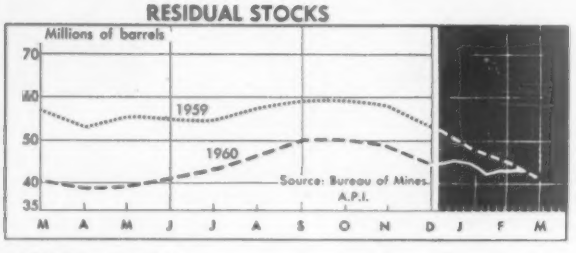












API REFINERY REPORT—MARCH 17, 1961

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, March 1960 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,152	475.1	30.4	346.1	162.1	49,994	10,442	32,268	12,651	1,111	525.4	34.1	343.9	170.7
Appalachian:														
District 1	105	40.0	4.1	25.3	13.0	6,116	683	2,329	578	100	39.1	4.4	21.4	12.7
District 2	98	46.7	6.7	17.7	11.7	3,056	375	1,000	387	102	43.6	8.8	15.8	17.1
Ind., Ill., Ky.	1,480	780.7	68.1	323.3	143.4	41,457	4,333	16,430	5,273	1,468	734.5	77.3	316.9	210.0
Minn., Wis., Dak.	116	56.3	8.9	24.9	18.4	6,910	636	4,467	651	116	55.5	5.8	26.5	19.8
Okla., Kans., Mo.	691	352.0	15.9	168.0	18.6	21,684	1,095	8,644	899	685	380.2	13.0	170.9	43.5
Inland Texas	299	209.6	13.4	52.0	15.6	8,365	491	1,400	2,485	286	211.6	8.9	51.8	19.2
Texas Gulf Coast	1,922	963.0	130.5	464.1	148.1	32,851	2,679	7,837	4,718	1,864	940.9	124.1	418.3	136.5
La. Gulf Coast	683	362.3	80.1	164.8	42.0	11,882	1,866	3,565	1,257	645	358.7	52.1	142.3	44.2
N. La. and Ark.	115	70.9	7.4	19.9	5.9	5,543	701	1,842	181	100	65.8	4.0	21.8	7.1
Rocky Mountain:														
New Mexico	22	9.1	0.6	6.0	2.0	850	48	138	91	25	12.5	0.5	4.1	2.8
Other Rocky Mt.	265	125.9	6.1	57.9	28.4	7,806	394	2,265	999	280	130.1	3.4	64.4	33.7
West Coast	1,095	498.7	32.7	189.1	311.7	29,005	1,497	13,195	12,828	1,135	539.6	29.9	198.4	284.8
Mar. 17, 1961	8,043	3,990.3	404.9	1,859.1	920.9	225,519	25,240	95,380	42,998	7,917	4,037.5	366.3	1,796.5	1,002.1
Mar. 10, 1961	8,264	4,076.3	484.4	1,840.7	865.7	224,653	24,896	95,888	43,299	.....	.....	.....	.....	.....
Mar. 18, 1960	7,857	3,958.9	358.7	1,839.1	1,003.6	224,464	18,784	82,442	40,991	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.86								
15-15.9	1.93								$1.81
16-16.9	2.00								1.86
17-17.9	2.06								1.91
18-18.9	2.13								1.96
19-19.9	2.20								2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9		3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9		3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9		3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.75-4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	**3.00-3.05**

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0°-35.9°, Fao	1.72
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm Said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Weyburn (light)	2.06
Midale C	1.70
Venezuela:	
Cumbarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long Ton)

(Latest reported spot fixtures)

★ Gulf-NY, dirty (ATRS—27.5%)	$2.07
★ PG-Japan, dirty (USMC—60%)	4.08
★ Carib.-UK, dirty (Scale—70%) (9s. 9d.)	1.37
PG-UK, dirty (Scale—50%) (30s. 2d.)	4.23

★Denotes change previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (91 octane)	11.75-12.00
★ Premium (99 octane)	14.50-14.75
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	10.50-11.00
★ Regular (92 octane)	10.75-11.25
★ Premium (98 octane)	11.75-12.25
California (rack) Los Angeles:	
Regular (90 octane)	11.00
Premium (94 octane)	12.00
Premium (100 octane)	13.50
Caribbean area (cargoes):	
Regular (87 octane)	9.50
Premium (97 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
★ Kerosine 42-44	10.375-10.625
★ Diesel oil (58 d.i. and above)	10.00-10.25
★ Distillate No. 1	10.00-10.25
★ Distillate No. 2	9.00-9.25
Gulf Coast (cargoes):	
★ Kerosine 41-43	9.875-10.25
★ Distillate No. 2	9.25-9.50
New York Harbor (barges):	
Kerosine 42-43	11.90
Distillate No. 2	10 90
Diesel fuel, 48-52 d.i.	11.05
Caribbean area (cargoes):	
Distillate No. 2	8.625

RESIDUAL FUEL (Bbl.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.90
Gulf Coast (cargoes):	
★ Bunker C fuel	2.20-2.30
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C	2.00
California (rack):	
Bunker C fuel, Los Angeles	2.25

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3 CALIF. LEASE BLOCKS, 35,000 Acres Govt. Central California; 8,000 Acres Fee leases Central California 1,100 Acres Newhall, offset production Cecil Blinn, 5160 N. Harrison, Fresno, California. BAldwin 7-0777.

WANT TO PURCHASE gas and Oil Properties—Submit Reserve Estimates, Income, etc. Box M-210, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL LEASE CRANE County, Texas: Available S/239 acres, Section 18, Block B-28, PSL, two miles from new gas discovery Section 23, Blk. 4, H&TC, Hill & Meeker well. Quick action, address landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

OHIO AND WEST VIRGINIA acreage for sale close to Big Play. Specialize in 10-15 thousand acre blocks or will lease on your form anywhere in the East. David Law, 716 Union Trust Bldg., Parkersburg, West Virginia. Phone: HU 5-6446.

OHIO, WEST VIRGINIA and Kentucky oil and gas leases for sale. Large blocks of acreage in competitive areas. Norman L. Botkin, Box 493, Charleston, West Virginia.

AVAILABLE—100 acres adjoining production in Hardin County. For information write P. O. Box 836 or Telephone GR 8-3434, Austin, Texas.

NEW OIL BOOM Central Nebraska. Shallow depth excellent reserves, good market. Independnt oil company controls over 100,000 acres in play. Seeks partner with $50,000 or better for development. Box M-337, The Oil and Gas Journal, Tulsa, Oklahoma.

Will sell a few "several thousand acre checkerboards" of leases in various areas in Pennsylvania and Ohio where seller will promptly test Oriskany, Halderberg, Medina and deeper formations—no pre-ration—ready market @ 27 cents per M.C.F. Seller willing to participate in drilling deals with responsible buyers. Excellent success record of seller includes recent significant Oriskany gas pool discovery in Ashtabula County, Ohio and "Shearer Oil Pool" discovery in Coshocton County, Ohio in 1952. Write to:

James I. Shearer, President, James Drilling Corporation
258 Newport Road, Blairsville, Pennsylvania

ROYALTIES

ROYALTY BUYERS—Income producing gas-distillate royalty, new, deep, dual completed wells, with additional sands behind the pipe. Ogden Oil Company, P. O. Box 409, Taylor, Texas. Phone EL 2-3352.

PRODUCTION WANTED

CAN USE sour gas production. Maximum 30 grains per CCF. Give analysis, quantity, pressure, location. 1047 San Jacinto Bldg., Houston 2, Texas. CA 2-9419.

WANT TO BUY

Marginal production with water-flood potential.

Box M-308
The Oil and Gas Journal
Tulsa, Oklahoma

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FOR Sale: Mobile field office, '47 Beck bus, 37,000 mi. Air Cond. 5 KVA 120 V a.c. plant. Clean, priced to sell. Box M-327, The Oil and Gas Journal, Tulsa, Oklahoma.

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PORTADRILL, Winter Weiss Model BHD-C, Comb. Air-water, mounted on Int'l. R-190 with less than 200 hours on new engine, other equipment recently overhauled, 450' drillpipe. Also 1957 Ford truck with new 700 Gal. tank. Both for $18,500. P. O. Box 933, Denver, Colo. HA 2-4719.

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12,000 BSD Naphtha
5,000 BSD Heating Oil

POWERFORMER
3,000 BSD Fixed Bed

INSTALLED 1955
Will Be Sold As Units or Piecemeal

PETRO-CHEM ISO-FLOW FURNACES with STAINLESS CONE AND TIP

30.7 MM BTU/hr.	CHROME Tubes
19.3 MM BTU/hr.	CHROME Tubes
17 MM BTU/hr.	CHROME Tubes
9.7 MM BTU/hr.	CHROME Tubes
9 MM BTU/hr.	Carbon Tubes
7.5 MM BTU/hr.	CHROME Tubes (2)
5 MM BTU/hr.	Carbon Tubes
2.5 MM BTU/hr.	Carbon Tubes
2 MM BTU/hr.	Carbon Tubes

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7,500 CFM @ 14.4 PSIG SUCTION 42.5 PSIG

Disch. Multi-Stage 8,025 RPM driven by 1,250 HP Synchronous Motor 3/60/2,300/1,200 RPM, 5 KW Direct Conn. Exciter, Falk Speed Increaser 6.70:1 Ratio, Precooler, Intercooler, and Aftercooler.

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Box 5203, Baltimore 24, Maryland

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2-300 bbl. welded tanks with fitting and walk. High and low pressure separators, heater, metering separator. All like new. Lundquist Pipe and Supply Company, Tulsa. LUther 3-9563.

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FOR SALE: Surplus equipment, new and used. Pumps, electric motors, switches, and transformers. Write for descriptive list and prices. East Texas Salt Water Disposal Company, Box 633, Kilgore, Texas.

FOR SALE: 1—24" x 75' De-Ethanizer Column with Accumulator: 1—36" x 49' De-Butanizer Column w/Condensor, Accumulator and Re-Boiler; 1—30" x 54' De-Propanizer Column with Reboiler, Condensor, Reflux Accumulator and Two Propane Dryers. Cities Service Petroleum Company, Att: T. P. Mace, Box 4577—Oklahoma City 9, Oklahoma.

WALKER-NEER, S-43 Spudder, completely equipped for tailing-in or workovers, with 5,000 foot lines nearly new, presently tailing-in a well near Ness City, Kansas. Price $20,000.00, will discount for cash. D. E. Dunne, Jr., 1005 Central Building, Wichita, Kansas.

3 RAY OIL Burners Type AP11, 58274-5 and AP 12-57328—Max. 60 G.P.H, 2 H.P. Motor 220/60/3 $150 each. P. O. Box-A, Lyons, Illinois.

DISMANTLING OIL tanks cut into plates 8 ft. long and over 4 ft. wide 5/16" wall thickness, suitable repair work retaining walls $40.00 net ton F.O.B. cars Lima, Ohio. West Ohio Pipe Co. Box 193, Lima, Ohio.

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50 to 4,000 sq. ft.
VESSELS—TOWERS
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½MM, 2½MM, 5MM BTU
PUMPS
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Drilling Equipment, Barges, Engines, Drill Pipe, Generator Sets, Etc.

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Sale Will Be Conducted On The Old Jess Edwards, Inc. Yard Off Industrial Road In Greens Bayou. Equipment May Be Inspected Anytime Beginning March 15 Until Time of Sale.

Everything Sells To The Highest Bidder Without Minimum or Reservation.

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1—Lee C. Moore Mast,—126', 350,000#
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3—Rotaries, Ideco, Bethlehem, Universal
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2—Rotary hooks, B. J. 4200 and 4300
3—Sets tongs—Web—Wilson & B. J.
4—Rotary hoses
3—Weight Indicators, Martin Decker
4—Swivels, Oilwell and Ideco
7—Generator sets 25 K.W. to 150 K.W.
16—Drill Collars 6¾" to 7½"
Approximately 30,000'—4½" Drill Pipe
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Rams and Drilling Spools—Sub-Structures—Welding Machines—Jib Cranes—Electric Hoists and Traveling Cranes—Two Marine Radio Sets—Fishing Tools—Fuel Tanks—Kelly Drive Bushings—Tool Houses and Dog House—Swabbing Unit. Tons and Tons of Scrap.

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1—230' x 75' x 11' riveted Drilling barge hull, super structure, decks, ballast pumps, piping, etc.
1—2 story crew quarters with Helicopter deck complete with furnishings, Approx. 65' x 47' x 18'
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REFINERY PROCESS Engineer with 3—5 years experience in Catalytic Cracking, HF Alkylation, and related units. Give complete resume of experience and salary requirement. Location Southwest. Box M-303, The Oil and Gas Journal, Tulsa, Oklahoma

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West Coast Engineering Company has a senior position for a qualified Process Design Engineer, proficient in electronic computer programming and application. Send complete resume to: Box M-272, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM REFINING or Chemical Engineer with refinery processing and computer programming experience for computer-economics assignment in Oklahoma. Submit resume of education, experience and salary expected. Box M-329, The Oil and Gas Journal, Tulsa, Oklahoma.

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Box M-328, The Oil and Gas Journal
Tulsa, Oklahoma

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Must have experience in Texas and Louisiana Gulf Coast areas and must be able to direct and coordinate the joint efforts of land and geological departments. Must have ability to originate and direct sound exploration program. Would prefer geological degree plus experience with financial and administrative problems related to operation of exploration and production company.

Box M-338, The Oil and Gas Journal
Tulsa, Oklahoma

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SENIOR PRODUCTION ENGINEER—10 years diversified experience—seeks incentive position. Box M-322, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PETROLEUM ENGINEER, 33, 11 years experience in production and reservoir work. Will re-locate. Box 284, Hobbs, New Mexico.

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BS, 2½ YEARS, Surface, Wellsite, Subsurface, Drafting Experience—Independent Producer. Nine Months—Exploration and Supervision, Rock Salt, Fresh Water for Chemical Company. Six Years—Production Department with Major Oil Company. Personal Interview Welcomed. Best References. Age 35. Married. Box M-325, The Oil and Gas Journal, Tulsa, Oklahoma.

ADMINISTRATION ENGINEER: 12 years responsible experience in project engineering, design, processing operations, maintenance scheduling at supervisory capacities for major oil refining company. Age 38, family, B. S. in Chemical Engineering. Resume available. Box 31 Q 160, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, California.

GEOLOGIST Organization, Analysis, Evaluation Exploration-Development. Excellent Line—Staff Background, District—Division Level. Primarily Mid-Continent—Texas, but familiar all U. S. and Canada. Box M-310, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED position with company needing representation in southern Appalachian area. 22 years experience, land, production and exploration, 3 years Appalachian. Have geologic and production data. Box M299, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN DRILLING—American, 34, Married. 10 years drilling experience Mid-Continent area and West Texas. 4½ years in Middle East with major oil company. Air Drilling experience. Welder. Presently employed as driller in Arabia. Desire employment with American company operating outside U.S.A. Prefer family status. Write: Box M-314, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 34, married, 8 years exploration, development and supervisory experience, South Texas; desires job with independent or small company. Box M-332, Oil and Gas Journal, Tulsa, Oklahoma.

THOROUGHLY experienced turbocharged engine compressor serviceman with machine shop background will relocate with producer or manufacturer. Box M-331, The Oil and Gas Journal, Tulsa, Oklahoma.

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GEOLOGY GRADUATE: no geology experience but extensive varied experience methods. Industrial and management engineering seeks creative and diversified assignment. Box M-334, The Oil and Gas Journal, Tulsa, Oklahoma.

MANUFACTURERS Representative: 10 years experience in administration organization and sales. Excellent contacts located in Canada in major Alberta city. Good references. Box M-335, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE ENGINEER, eight years experience with major in reservoir engineering, production, workovers, secondary recovery, etc. Seeking challenging position. Responsible and hard worker. Resume on request. Box M-336, The Oil and Gas Journal, Tulsa, Oklahoma.

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Gathering systems for oil or gas. Box M-330, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED PRODUCER, want associates to drill 500 ft. Bartlesville sand, offset to nice producer. Montogomery County, Kansas. Will furnish references. Box M-320, The Oil and Gas Journal, Tulsa, Oklahoma.

MISCELLANEOUS

CLIENTS WANTED—for continuation of geological study, Muhlenberg County, Kentucky. Retainer basis. William K. Bryant, Geologist, Box 341, Scottsville, Kentucky.

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Do you want your drilling or production speciality or process developed and marketed? Either patented or applied for. Describe briefly; mail to Box M-259, The Oil and Gas Journal, Tulsa, Oklahoma. If interested, principal will negotiate; if not, will promptly advise.

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Box M-318, The Oil and Gas Journal
Tulsa, Oklahoma

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More Discovery Wells

(Continued from Page 163)

EAST TEXAS

Rusk County:

Fred Whitaker 1 William O. Compton, Stephen C. George Sur., A-311, 6 miles southeast of Kilgore. Open-flow potential (calculated) 2,500 M.c.f.d., 26 BC per M.M.c.f., 60.4°, shut-in TP 2,971 psi., perf. 7,451-57 ft., lower Pettet. TD 7,802 ft. Discovery well of Pirtle field, 6,500 ft. southeast of Danville field.

Van Zandt County:

Humble Oil & Refining Co. 1 W. K. Savage, Josiah Walker Sur., A-902, 3½ miles northwest of Grand Saline. IP 100 BOPD, ¼-in., 46.4°, TP 250 psi., GOR 1,660 cu. ft. per bbl., perf. 8,290-8,300 ft., Rodessa. TD 13,144 ft. in salt.

NORTH TEXAS

Hardeman County, Conley Miss. field:

Shell Oil Co. 1 D. T. Wilson et al., 8 miles west of Chillicothe in Sec. 90, W&NW Sur. A-1858. IPF 166 BOPD, 22/64-in. choke, 47°, GOR 213:1, TP 140 psi., packer. Miss. 7,950-8,076 ft.; IPF 83 BOPD, 24/64-in. choke, 46°, GOR 506:1, TP 20 psi., packer, Osage Miss. 8,095-8,120 ft. TD 9,471 ft. Dual oil discovery.

SOUTHWEST TEXAS

Jim Wells County:

Ragsdale, Pierce & Crain 1 Paul J. Haverlak, Lot 7, Gulf Coast Farming & Trucking Subd., Casa Blanca Sur., 1 mile east of Orange Grove. AOF 3,400 M.c.f.d., dry gas, shut-in TP 790 psi., perf. 1,896-1,902 ft. TD 2,003 ft. New pay in Orange Grove area.

Afroma Oil & Gas Co., Inc., et al. 1-A E. H. Scheel, Lot 3, Blk. S, N. G. Collins Farm Lots Subd., Los Presenos Grant 1, mile southeast of Alice. IPP 70 BOPD, 38°, GOR 900 cu. ft. per bbl., perf. 4,858-60 ft., Frio. TD 4,911 ft. New-field discovery.

Appell Petroleum Corp. 1-A Goldapp, La Vaca Grant, 4 miles southwest of Alice. IP 86 BOPD (net), 3% water, 8/64-in., 47°, GOR 1,382 cu. ft. per bbl., 100 psi., perf. 4,515-19 ft. TD 5,508 ft. New pay in Tsesmelis field.

Zapata County:

Gulf Oil Corp. 1 Hector Vela, Section 5, T&NO Sur., A-100, 6 miles northeast of Escobas. AOF 12,200 M.c.f.d., dry gas, shut-in TP 9,025 psi., perf. 13,272-82 ft., Wilcox. TD 14,034 ft. New deep Wilcox discovery in old Martinez shallow gas area.

T5XAS GULF COAST

Calhoun County:

Billy Bridwell et al. 1 Ella Peterson De Bord, Sec. 1, Wolf Point Ranch Subd., Sam Houston Sur., A-22, 3 miles north of Olivia. AOF 4,300 M.c.f.d., GLR 50 M.c.f. per bbl., 56.6°, perf. 7,535-41 ft., Frio; and 3,300 M.c.f.d., GLR 75 M.c.f. per bbl., 57°, 2,415 psi., perf. 7,660-68 ft. and 7,674-82 ft., Frio. TD 12,180 ft. New-field discovery.

Hardin County:

Ada Oil Co. 3 Harry V. Himes, McKinney & Williams Sur., A-401, 3 miles southeast of Village Mills. IP 37.50 BOPD, 12/64-in., 47.8°, TP 100-500 psi., GOR 6,880 psi., perf. 9,783-91 ft., Wilcox. TD 10,108 ft. New pay in East Hickory Creek field.

Harris County:

Ben P. Piepgrass 1 M. C. Stophey Estate,

Reels & Troubough Sur., A-59. AOF 12 M.M.c.f.d., dry gas, shut-in bottom-hole pressure 1,237 psi., perf. 2,894-2,901 ft., Miocene. TD 3,020 ft. New pay in Clinton field.

Acco Oil & Gas Co. 1 Mamie Furr, C. Martinez Sur., A-545, in Houston city limits. AOF 3,900 M.c.f.d., dry gas, shut-in TP 1,025 psi., perf. 2,496-99 ft., Miocene; and 6,200 M.c.f.d., dry gas, shut-in 1,060 psi., perf. 2,449-53 ft., Miocene. TD 6,616 ft. New pays in Clinton field.

Jackson County:

Roy R. Gardner 2 Jean T. Herlin et al., Patrick Green Sur., 2 miles south of Francitas. IP 107 BOPD, 9/64-in., 42.6°, GOR 795 cu. ft. per bbl., TP 640 psi., perf. 7,087-91 ft., Frio. TD 8,320 ft. New-field discovery in Francitas area.

Forest Exploration Corp. 1 J. H. Robinson, John McHenry Sur., A-45, 12 miles northwest of Edna. AOF 10,300 M.c.f.d., dry gas, shut-in TP 1,703 psi., perf. 4,094-97 ft.; and 52 M.M.c.f.d., dry gas, 952 psi., perf. 2,408-11 ft. TD 4,520 ft. New-field discovery.

Karnes County:

Southern Minerals Corp. 16 Martinez Mercantile, Luis Menchaca Grant, A-5, 2 miles northwest of Falls City. IP 80 BOPD, open 2-in., jetting, 38.3°, TP 30-100 psi., GOR 83 cu. ft. per bbl., perf. 6,068-73 ft., Bonner sand. TD 6,159 ft. New pay in Falls City field.

Lavaca County:

Hawkins & Hawkins 1 Mrs. Sada Barnes, G. W. Edwards Sur., A-158, 2 miles north of Speaks. AOF 840 M.c.f.d., GLR 37,178 cu. ft. per bbl., 49.8°, shut-in TP 2,845 psi., perf. 8,893-99 ft., Wilcox; and 6 M.M.c.f.d., GLR 45,869 cu. ft. per bbl., 53.8°, 3,026 psi., perf. 8,809-19 ft., Wilcox. TD 10,170 ft. New-field discovery.

Matagorda County:

John W. Pace 1 T. N. Mauritz unit, Lot 10, Moore Pasture Subd., John Holmes Sur., A-191, 3 miles southeast of Blessing. IP 1,250 M.c.f.d., 60 BOPD, 10/64-in., TP 2,250 psi., perf. 8,891-98 ft., Frio. TD 9,400 ft. New pay in Pheasant field.

Wharton County:

Ancon Oil & Gas Co. 1-B J. A. Halamicek, Frank Page Sur. 46, 7 miles northwest of El Campo. AOF 8 M.M. c.f.d., dry gas, shut-in BHP 2,109 psi., perf. 4,696-4,702 ft., Frio. TD 5,309 ft. New pay in Swanson (suggested name) field.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that 5,328.38 acres of land in 49 parcels within the known geologic structures of a number of fields in Big Horn, Campbell, Fremont, Natrona and Washakie Counties, Wyoming, are offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, May 3, 1961, when bids will be opened. Full details of the offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Section.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that approximately 120 acres of land in one parcel within the known geologic structure of the Tar Creek field, Wilkinson County, Mississippi, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 P.M., E.S.T. April 12, 1961, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Manager, Eastern States Land Office, Bureau of Land Management, Washington 25, D. C. H. K. Scholl, Manager.

ADVERTISERS . . . in this issue

A

ACF Industries, Incorporated, W-K-M Division 35
Ajax Iron Works 110
American Iron & Machine Works Company Subsidiary, American Machine & Foundry Company 33
American Machine & Foundry Co. American Iron & Machine Works Co. 33
American Meter Company 139
American Hot Dip Galvanizers Association, The 102, 103
Aquaness Department, Atlas Powder Company 45

B

Baker Oil Tools, Inc. 52
Barco Manufacturing Company 126
Baroid Division, National Lead Co. 50
Bethlehem Steel Company 24
Black, Sivalls & Bryson, Inc. 65
Bovaird Supply Co., The 1
Bradford Supply Company 15
BrakeSol, Inc. 47
Brodie Company, The Ralph N. 26
Brown Oil Tools, Inc. 46

C

Cabot Corporation, Machinery Division ..... Inside Back Cover
Cameron Iron Works, Inc. 150
Caterpillar Tractor Co. 107
C-B Southern, A Division of The Cooper-Bessemer Corporation 25
Chevrolet Division of General Motors 20, 21
Classified Advertising 174, 175, 176
Columbus Hotel, The 162
Continental-Emsco Company, a Division of the Youngstown Sheet and Tube Company 3
Cook Company, C. Lee 118
Core Laboratories, Inc. 155
Corrosion Services Incorporated 136

D

Dallas Manufacturing Company 128
Dover Corporation— W. C. Norris Division 44, 109, 137
Dow Corning Corporation 22
Dowell 81, 142
du Pont 39, 40
Duff-Norton Company 158

E

Edward Valves, Inc. 19
Engineering Controls, Inc. 129
Engineering Enterprises, Incorporated 43

F

Falk Corporation, The 37
Fischer & Porter Co. 68, 69
Foxboro Company, The 10, 11
Fuller Company 38

G

Gardner-Denver Company 27, 28, 29
Gates Rubber Co., The 49
General Mills, Inc., Chemical Division 125
Gillespie and Sons Inc., Glenn 162
Goodrich Chemical Company, B. F. (Hycar) 17
Government of Alberta 135
Grove Valve and Regulator Company 13

H

Halliburton Company ..... Inside Front Cover, 4, 5
Harbison-Fischer Mfg. Co. 48
Henson, Kenneth W. 130
Huey & Co., S. E. 130
Hughes Tool Co. ..... Back Cover
Humble Oil & Refining Co. 143

I

International Nickel Company, Inc., The 54

J

Jensen Bros. Mfg. Co., Inc. 138
Jet-Lube Inc. 134
Johnston Testers, Inc. 36
Jones Company, The S. M. 157

K

Kelley Co., Inc., Ben F. 137
Kemp Mfg. Co., C. M. 12

L

Larkin Packer Company, Division Koehring Company 31
Liberty Mutual Insurance Company 7

M

Macwhyte Wire Rope Company 30
Magnet Cove Barium Corp. 34
Manning, Maxwell & Moore, Inc. 146
Martin-Decker Corp. 137
Mayo Hotel, The 130
McDonough Marine Service 130
Mercoid Corporation, The 43
Milwhite Mud Sales Company 23
Mission Mfg. Company 132

N

National Supply Division of Armco Steel Corporation 97, 98, 99, 100
National Tank Company 178
Nelson Electric Mfg. Co. 127
Norris, W. C., Division of Dover Corporation 44, 109, 137

O

Oil Well Supply Division 6

P

Perrault Supply, A Service of Allied Paint Division, H. K. Porter Company, Inc. 128
Petroleum Electric Power Assn. 18

R

Radio Corporation of America 123
Reda Pump Company 140
Republic Rubber Division of Lee Rubber & Tire Corp. 156
Rockwell-Standard Corporation 41

S

Salt Water Control, Inc. 32
Shaffer Tool Works 16
Sikorosky Aircraft Division, United Aircraft Corporation 14
Smith Tool Co., A Division of Smith Industries International Inc. 148

T

Texaco Inc. 2

U

United States Steel Corporation— Oil Well Supply Division 6

V

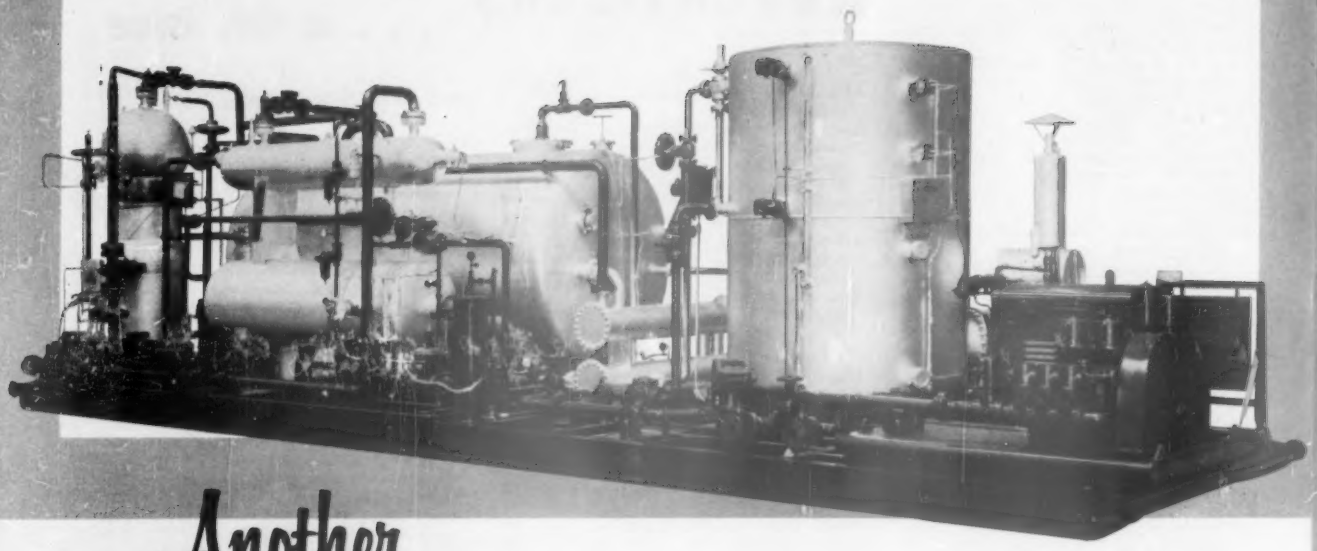
Valley Electric Corp. 47

W

Wall Colmonoy Corporation 134
Warner Lewis Company 105
Well Equipment Mfg. Corp. 159
W-K-M Division of ACF Industries Incorporated 35
Worcester Valve Co., Inc. 137
Worthington Corporation 8, 9

Y

Youngstown Sheet and Tube Company 144, 145



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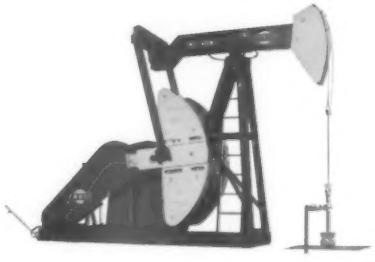

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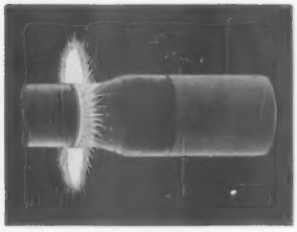

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